Service Manual

Panasonic

CO_2 Incubator

MCO-230AIC
MCO-230AICUV
MCO-230AICUVH

Panasonic Healthcare Co., Ltd.
Biomedical Division

SM9910313

Effective models

This service manual is effective for following models.

Model name	Voltage and Frequency	
MCO-230AIC-PE	220~240V	50Hz/(60Hz common)

Model name	Voltage and Frequency	
MCO-230AICUV-PA	110~120V	60Hz
MCO-230AICUV-PE	220~240V	50Hz/(60Hz common)

Model name	Voltage and Frequency	
MCO-230AICUVH-PE	220~240V	50Hz/(60Hz common)

Contents

Features

1. Improve basic performance
 * Complete solution of condensation issue (No condensation in chamber and inside outer door).
 * Humidity control pole for preventing condensation.

2. Improve cleaning efficiency
 * Interior and shelf support are integrated in order to save labor of removing shelf support.

3. Improve usability
 * Comfortable operation by installing full colour LCD + touch panel.
 * Simple operation by original GUI.

Caution

*** Parts replacement and option unit installation must be done by trained serviceman.**
*** Serviceman must refer to the section “Electric parts” and “Cooling unit parts” about the parts for those operation.**

Specifications

■Structural specifications

Item	CO_2 incubator MCO-230AIC	CO_2 incubator MCO-230AICUV	CO_2 incubator MCO-230AICUVH
Name	CO_2 Incubator		
External dimensions	W770 mm x D730 mm x H905 mm (W30.3 inch x D28.8 inch x H35.6 inch)		
Internal dimensions	W643 mm x D523 mm x H700 mm (W25.3 inch x D20.6 inch x H27.5 inch)		
Interior volume	230 L (20.62 cu.ft.)		
Exterior	Painted steel (Rear cover has no paint)		
Interior	Stainless steel containing copper		
Outer door	Painted steel		
Inner door	Tempered glass		
Trays	4 trays made of stainless steel containing copper W620 mm x D450 mm x H12 mm (W24.4 inch x D17.7 inch x H0.47 inch) Maximum load: 5 kg/tray		
Access port	Inner diameter: 30 mm (1.18 inch), On the back side		
Insulation	Extruded polystyrene		
Heater	345 W		
Fan fixing method	Snap fixing		
Air filter	0.3 μm, Efficiency: 99.97 % or higher		
UV lamp	-----	4 W x 1 (ozone-free emission)	
Remote alarm contacts	Allowable contact capacity: DC 30 V, 2 A		
CO_2 inlet connection	4 mm to 6 mm (0.157 inch to 0.236 inch) diameter tube can be connected		
CO_2 inlet pressure	0.03 MPa(G) (0.3 kgf/cm^2(G), 4.3 psi(G))		
Weight	90 kg		
Accessories	-----		2 unlock key
	Power supply cord cover plate, 4 trays ,1 gas tube, 1 humidifying pan, 2 tube bands 1 removal power supply cord for UK 1 removal power supply coed for EU countries other than UK (-PE only)		
	1 removal power supply cord, Power supply cord cover plate, 4 trays ,1 gas tube, 1 humidifying pan, 2 tube bands		

Optional accessories (Refer to table 1)	UV system set (MCO-170UVS)	standard equipment
	H_2O_2 decon board (MCO-170HB) Electric lock (MCO-170EL)	standard equipment
	H_2O_2 generator (MCO-HP)	
Optional accessories (Refer to table 2)	Double stacking bracket (MCO-170PS) Stacking plate (MCO-230SB)	
Optional accessories	H_2O_2 reagent (MCO-H2O2-) Gas regulator (MCO-100L) Gas auto changer (MCO-21GC) STD gas auto calibration kit (MCO-SG) Tray (MCO-230ST: same as that of standard accessory) Half tray (MCO-35ST) Roller base (MCO-230RB) Interface board (MCO-420MA-PW) (USA only) Small door (MCO-230ID)	
Optional Software product	Data acquisition system (MTR-5000) Interface board (MTR-L03); For LAN Interface board (MTR-480-); For RS-232C/RS-485	
Optional product for using in the chamber	Shaker for CO_2 incubator（MIR-S100C）	

Table 1. Optional accessories for each function

	MCO-230AIC	MCO-230AICUV	MCO-230AICUVH
To disinfect by UV	UV system set (MCO-170UVS)	standard equipment	
To decontaminate by H_2O_2.	UV system set (MCO-170UVS) H_2O_2 generator (MCO-170HP) H_2O_2 decon board (MCO-HB) Electric lock (MCO-170EL)	H_2O_2 generator (MCO-HP) H_2O_2 decon board (MCO-170HB) Electric lock (MCO-170EL)	H_2O_2 generator (MCO-HP)
To lock the outer door	Electric lock (MCO-170EL)		standard equipment

Table 2. Required bracket/plate for each incubator combination of double stacking

Upper product	MCO-230AIC MCO-230AICUV MCO-230AICUVH	MCO-19AIC MCO-19AICUV MCO-19AICUVH	MCO-19M MCO-19MUV MCO-19MUVH	KM-CC17R2 KM-CC17RU2 KM-CC17RH2 MCO-17AIC MCO-170AICUV MCO-170AICUVH	MCO-18AC
Lower product	MCO-230AIC/230AICUV/230AICUVH				
Bracket Plate	Double stacking bracket MCO-170PS	Standard equipment MCO-230SB			

∗ It is possible to Stacking plate MCO-230SB in the case of the following combination.

Upper product: MCO-230AIC/230AICUV/230UVH

Lower product: MCO-20AIC

■Control specifications

Item	MCO-230AIC	MC230-AICUV	MCO-230AICUVH
Heating system	DHA system (heater jacket + air jacket system)		
Humidifying system	Natural evaporation with humidifying pan		
Temperature controller	PID control system + Humidity control bar		
Temperature display	Digital display		
CO_2 controller	PID control system		
CO_2 density display	Digital display		
Air circulation	Fan assisted		
Alarms	Automatic set temperature alarm, Automatic set CO_2 density alarm, High limit temperature alarm, CO_2 gas, various sensor/heater alarms		
Control panel	WVGA full colour LCD, Resistive film touch panel * No touch sound		
Log	USB * Standard equipment for all models * Transmit log of temperature, CO_2, door open/close, alarm		
Security lock	Option	Option	Standard equipment
	Unlock with 1～6 digit password Automatically locked 1 min. after door close 1 password for 1 unit * Password is same as key lock		
Self-diagnosis	Each sensor is in abnormal condition - Display error code and chamber temperature on message display. - Reverse remote alarm terminal (optional) and buzzer sounds		

■Performance specifications (for - A models、)

Name	CO_2 Incubator
Model	MCO-230-AICUV-PA MCO-230AICUVH-PA
Temperature control range	Ambient temperature+5 ^{o}C to 50 ^{o}C* (ambient temperature: 5 ^{o}C to 35 ^{o}C)
Temperature distribution	±0.25 ^{o}C (ambient temperature: 23 ^{o}C, setting: 37 ^{o}C, CO_2: 5 %, no load)
Temperature variation	±0.1 ^{o}C (ambient temperature: 23 ^{o}C, setting: 37 ^{o}C, CO_2: 5 %, no load)
CO_2 control range	0 % to 20 %
CO_2 variation	±0.15 % (ambient temperature: 23 ^{o}C, setting: 37 ^{o}C, CO_2: 5 %, no load)
Chamber humidity	95 %R.H.±5 %R.H.
Applicable environment condition	Temperature: 5 ^{o}C to 35 ^{o}C, Humidity: 80 %R.H. max. (The designed performance may not be obtained If the ambient temperature is equal or less than 15 ^{o}C)
Noise level	25 dB (A scale)
Power consumption	Max. 430 W
Heat emission	Max. 1,250 kJ/h
Rated voltage, frequency	AC 110 V-120 V, 60 Hz
Amperage	Max. 3.8 A

*When ambient temperature is 25 ^{o}C, temperature control range: 30 ^{o}C～50 ^{o}C. Regardless of ambient temperature, the maximum of temperature control range is always 50 ^{o}C.

Note: The unit with CE mark complies with EC directives.
Based on our measuring method.

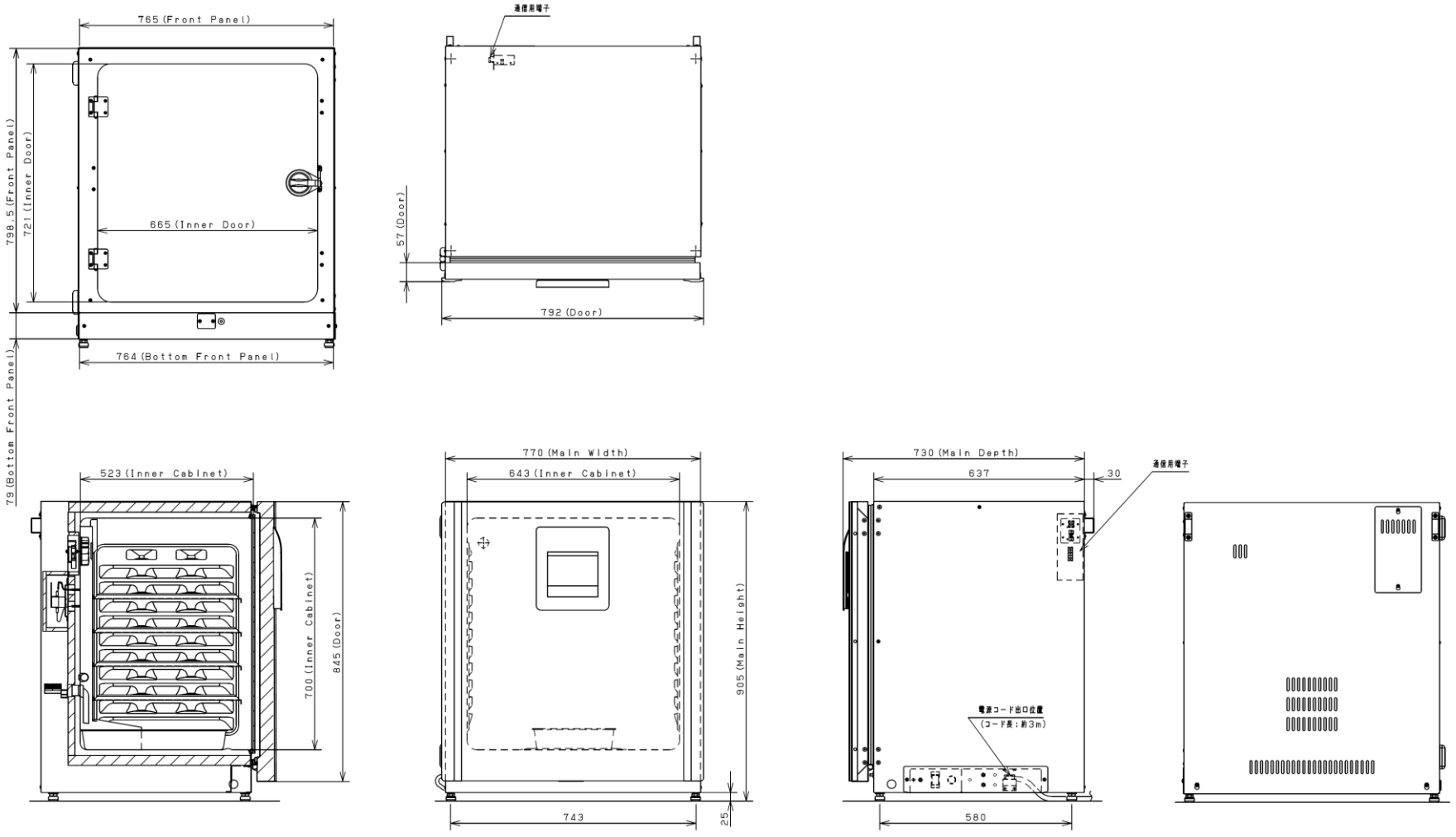
■Performance specifications (for - E models)

Name	CO_2 Incubator
Model	MCO-230AIC-PE MCO-230AICUV-PE MCO-230AICUVH-PE
Temperature control range	Ambient temperature+5 °C to 50 °C* (ambient temperature: 5 °C to 35 °C)
Temperature distribution	±0.25 °C (ambient temperature: 23 °C, setting: 37 °C, CO_2: 5 %, no load)
Temperature variation	±0.1 °C (ambient temperature: 23 °C, setting: 37 °C, CO_2: 5 %, no load)
CO_2 control range	0 % to 20 %
CO_2 variation	±0.15 % (ambient temperature: 23 °C, setting: 37 °C, CO_2: 5 %, no load)
Chamber humidity	95 %R.H.±5 %R.H.
Applicable environment condition	Temperature: 5 °C to 35 °C, Humidity: 80 %R.H. max. (The designed performance may not be obtained If the ambient temperature is equal or less than 15 °C)
Noise level	25 dB (A scale)
Power consumption	Max. 430 W
Heat emission	Max. 1,250 kJ/h
Rated voltage, frequency	AC 220 V-240 V, 50 Hz
Amperage	Max. 2.1 A

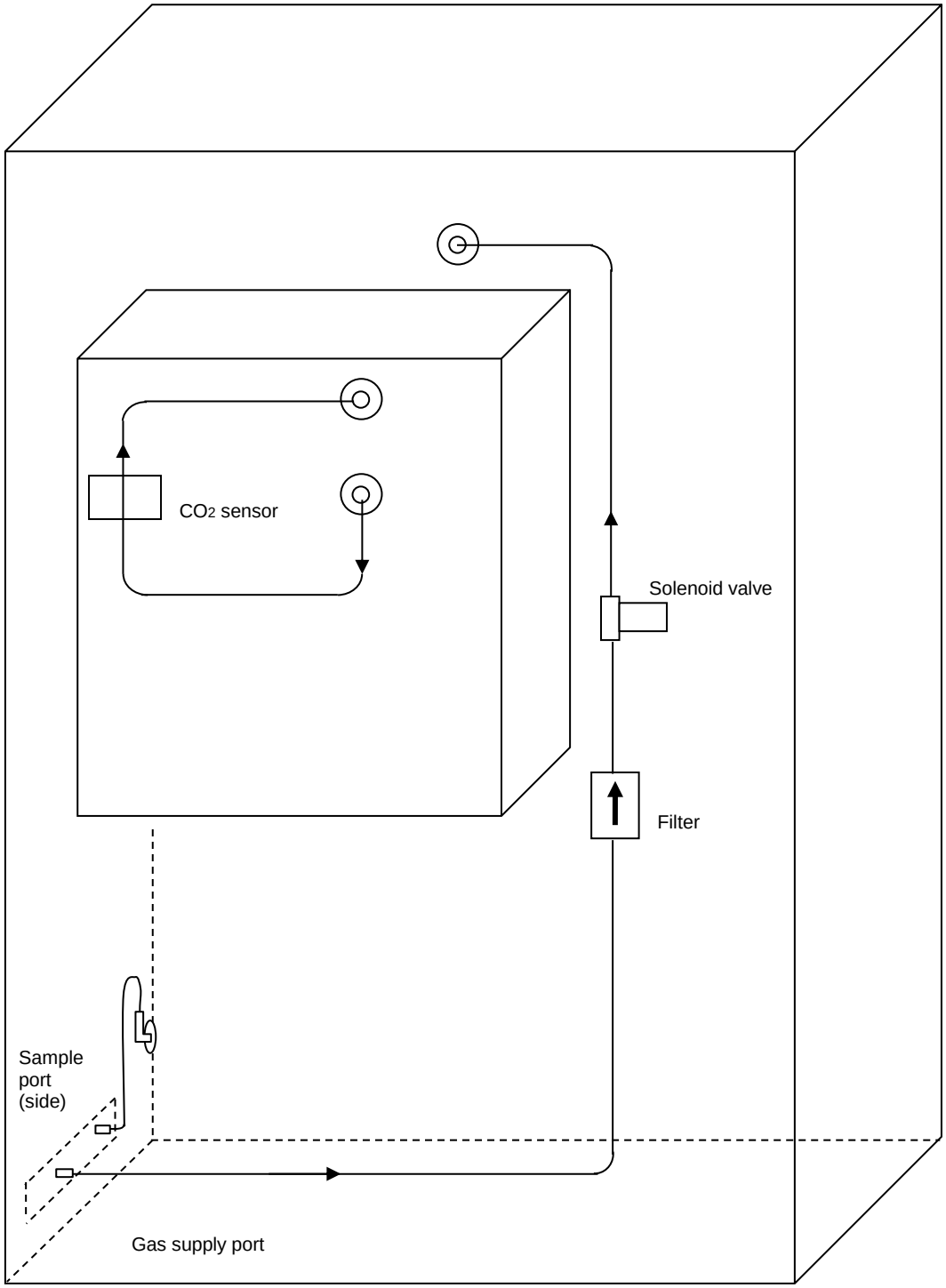
*When ambient temperature is 25 °C, temperature control range: 30 °C～50 °C. Regardless of ambient temperature, the maximum of temperature control range is always 50 °C.

Note: The unit with CE mark complies with EC directives.
Based on our measuring method.

Dimensions


765 (Front Panel)
798.5 (Front Panel)
721 (Inner Door)
665 (Inner Door)
764 (Bottom Front Panel)
79 (Bottom Front Panel)
通信用端子
57 (Door)
792 (Door)
523 (Inner Cabinet)
700 (Inner Cabinet)
845 (Door)
770 (Main Width)
643 (Inner Cabinet)
905 (Main Height)
743
25
730 (Main Depth)
637
30
通信用端子
電源コード出口位置
(コード長：約3m)
580

Gas circuit


CO2 sensor
Solenoid valve
Filter
Sample
port
(side)
Gas supply port

Temperature calibration procedures

Ex. TEMP. SV=37.0℃ and actual temp. in chamber=36.5℃.

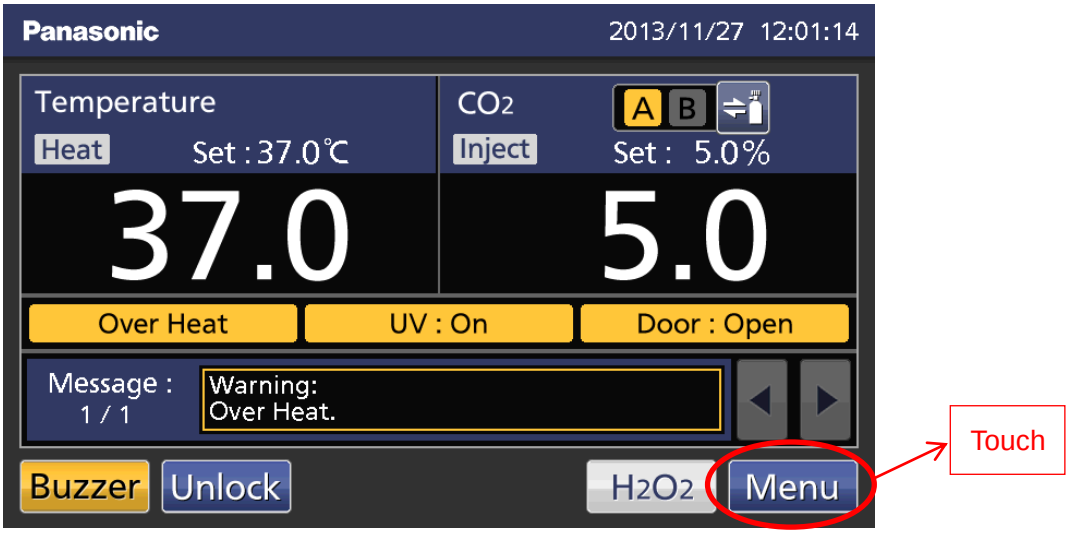
Step	Display and operation	MENU select
0	Install temp. sensor for calibration at center of chamber and running till temp. becomes stable.	
1	At Top display, touch Menu key to show Menu display and select Tools#1.	Menu/Tools #1
2	At Tools#1 display, select Temp./CO_2 Calibration.	Temp./CO_2 Calibration
3	Input measured temp. in Temp Span box.	Temp Span
4	Touch Cal key at right side of Temp Span.	Cal
5	After touching Cal key, touch Top key on upper right side of display.	Top

(Note) It is important for temperature calibration to measure chamber temperature accurately. Therefore, used thermometer should have more than JIS0.5 class accuracy and measure center of chamber.

Maximum value of temp. calibration is ±1.0℃, so only when the value within ±1.0℃ range is input, Cal key becomes active. It means several times calibration is required if more than 1.0℃ calibration is necessary.

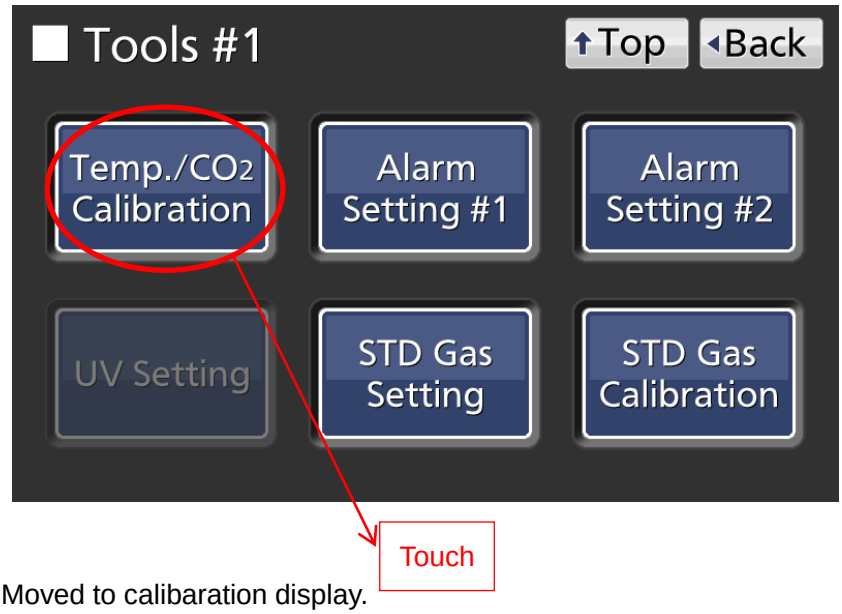
Move to calibration display

1. Touch Menu key at Top display.

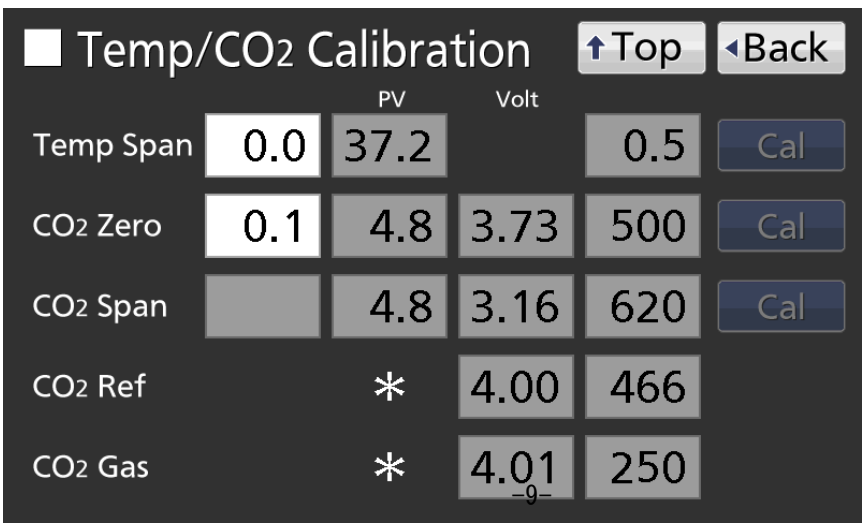


2. Touch Tools#1 at Menu display.

3. Touch Temp./CO_2 Calibration at Tools#1 display.

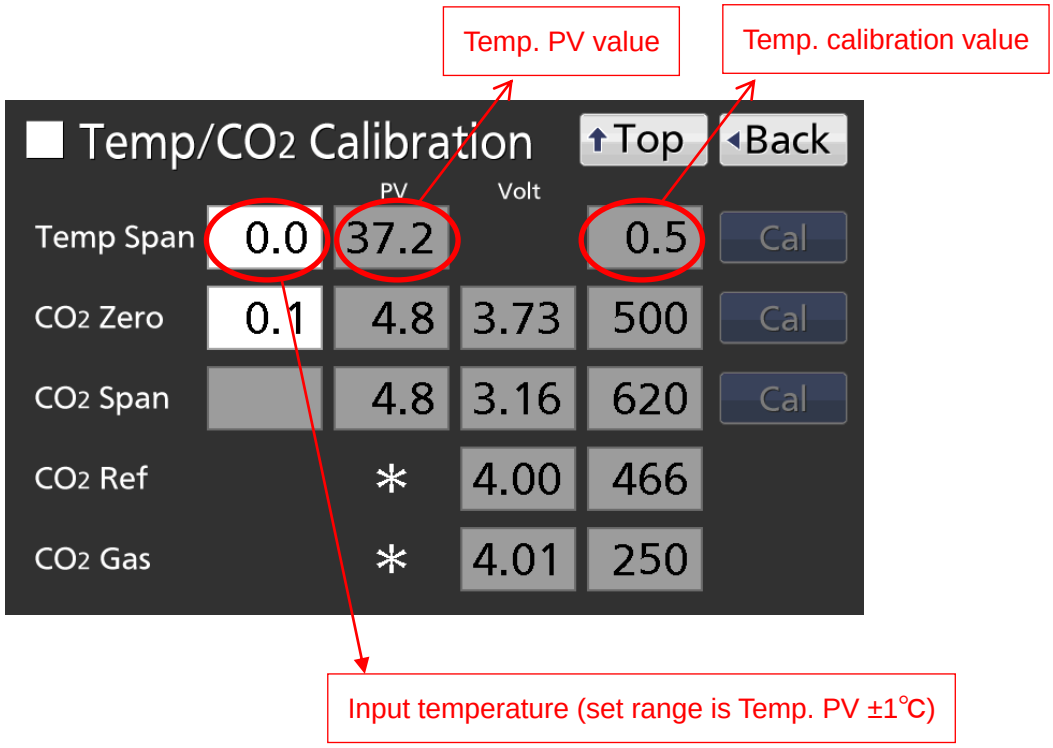


4. Moved to calibaration display.

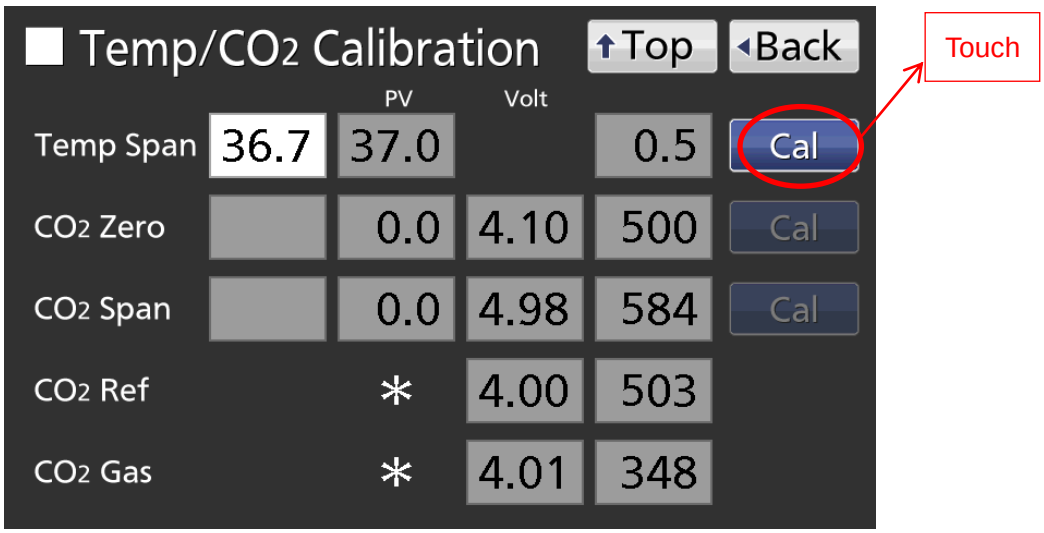


Temp. calibration method

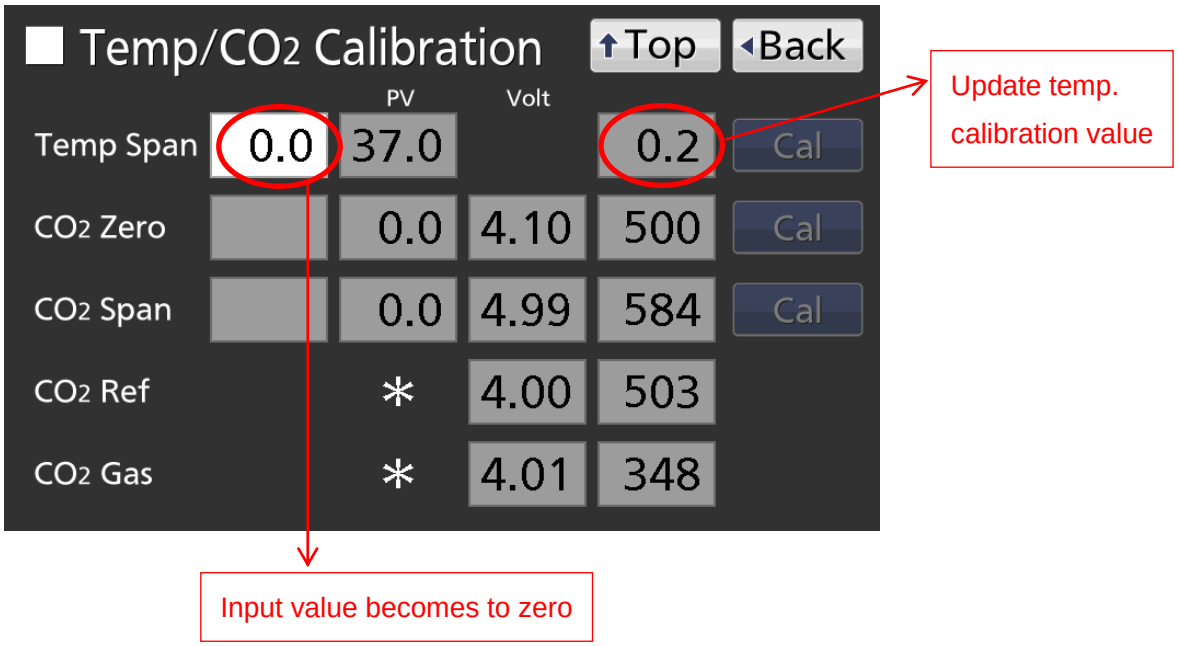
Input temperature measured by thermometer.



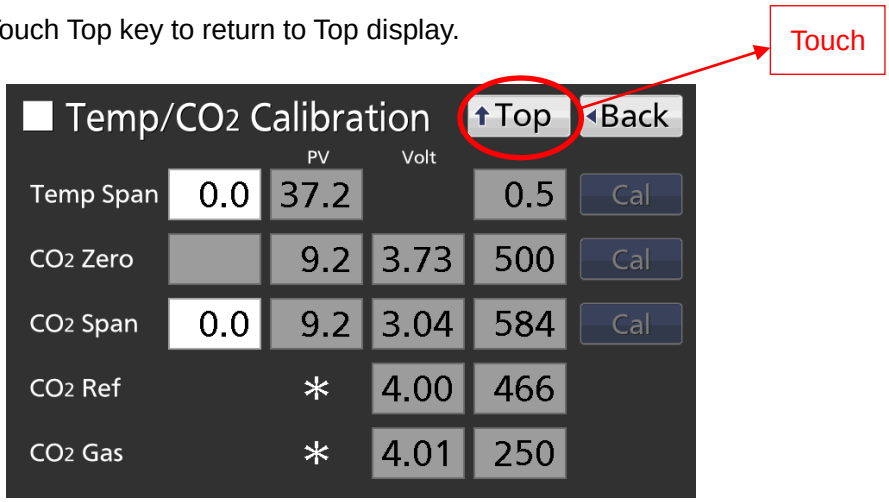
1. When input value is acceptable, Cal key becomes active and so touch it.



2. Temp. calibration value is updated.



3. Touch Top key to return to Top display.



CO_2 density calibration procedures

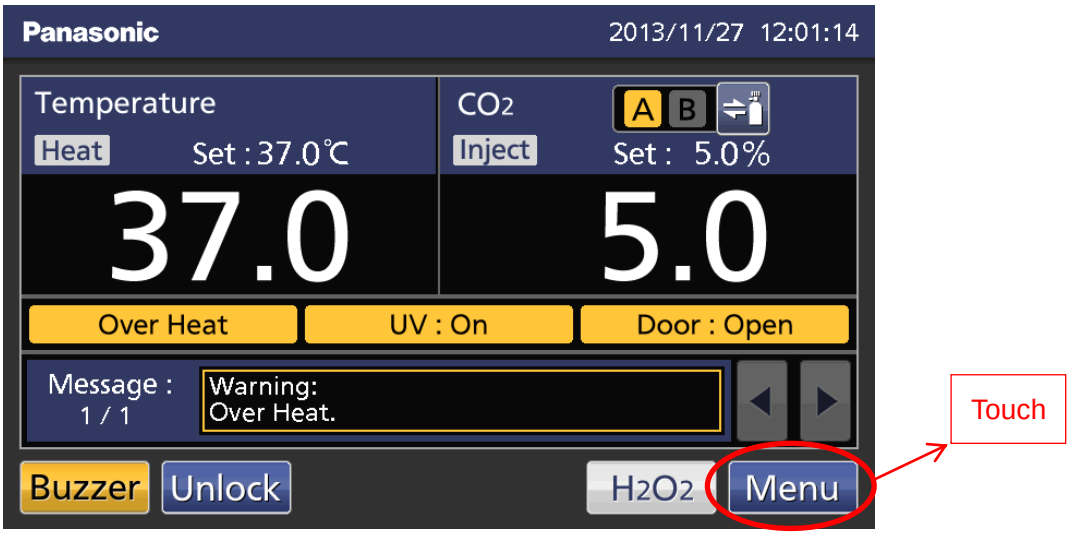
Step	Display and operation	MENU select
0	Measure chamber CO_2 density from sample port at right side of unit.	
1	At Top display, touch Menu key to show Menu display.	Menu
2	Select Tools#1 at Menu display.	Tools#1
3	Select Temp./CO_2 Calibration at Tools#1 display.	Temp/CO_2 Calibration
4	Input measured CO_2 density in CO_2 Span box. (Acceptable range at one time: ±1.0%)	CO_2 Span
5	Touch Cal at right side of CO_2 Span.	Cal
6	After touching Cal key, touch Top key on upper right side of display.	Top

(Note1) After CO_2 density calibration, if actual CO_2 density and displayed CO_2 density do not accord, please repeat same procedures several times.

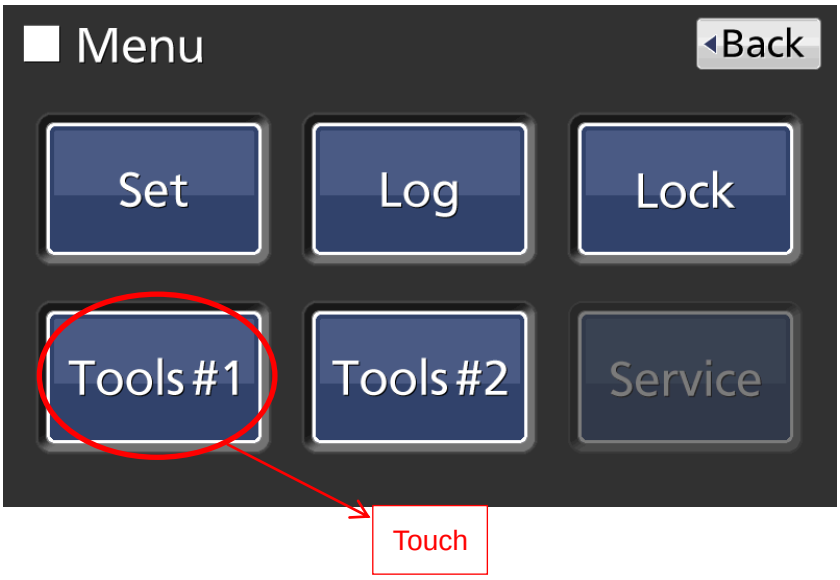
(Note2) CO_2 sensor span adjustment cannot be adjusted unless CO_2 set value is between 2.0% and 22.0%..

Move to calibration display

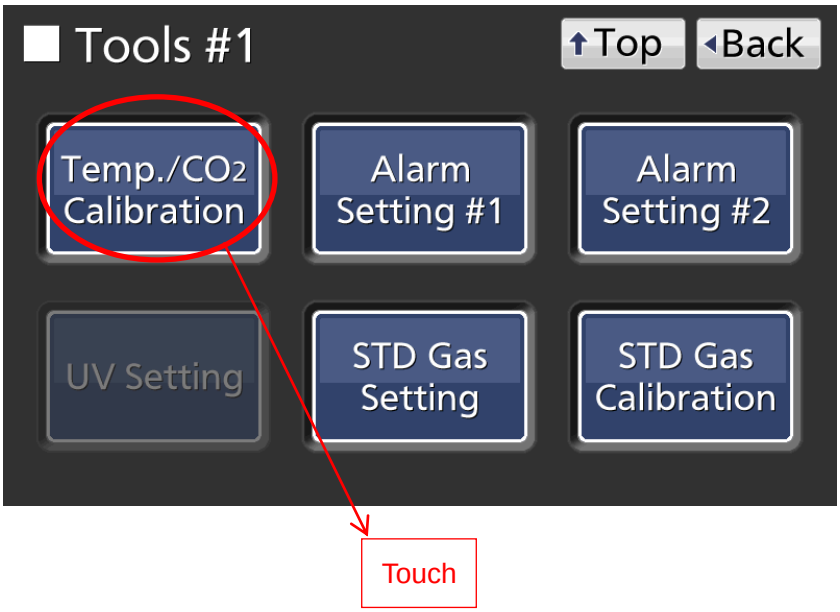
1. Touch Menu key at Top display.



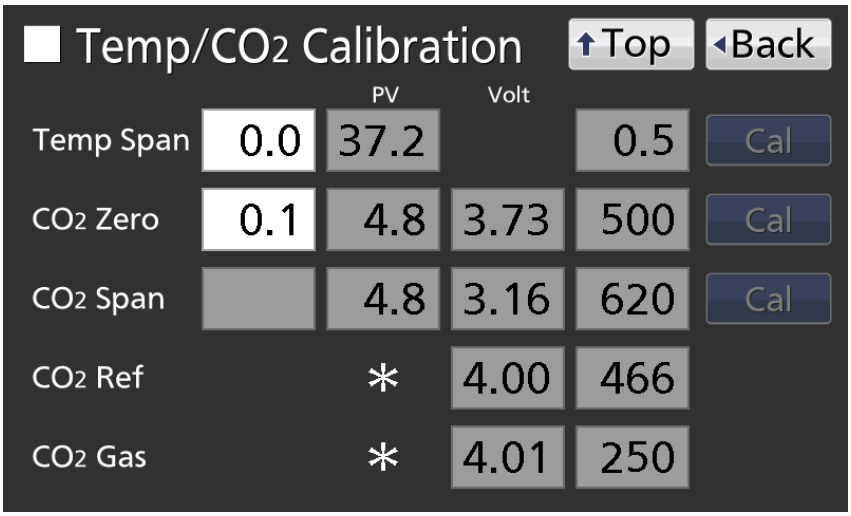
2. Touch Tools#1 at Menu display.



3. Touch Temp./CO_2 Calibration at Tools#1 display.

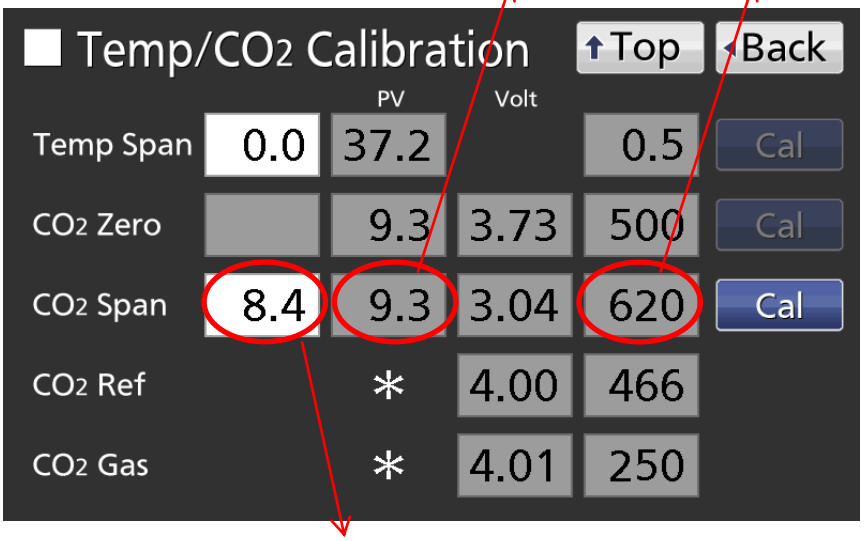


4. Moved to calibaration display.



CO_2 span calibration method

1. Input the value of CO_2 densitometer.

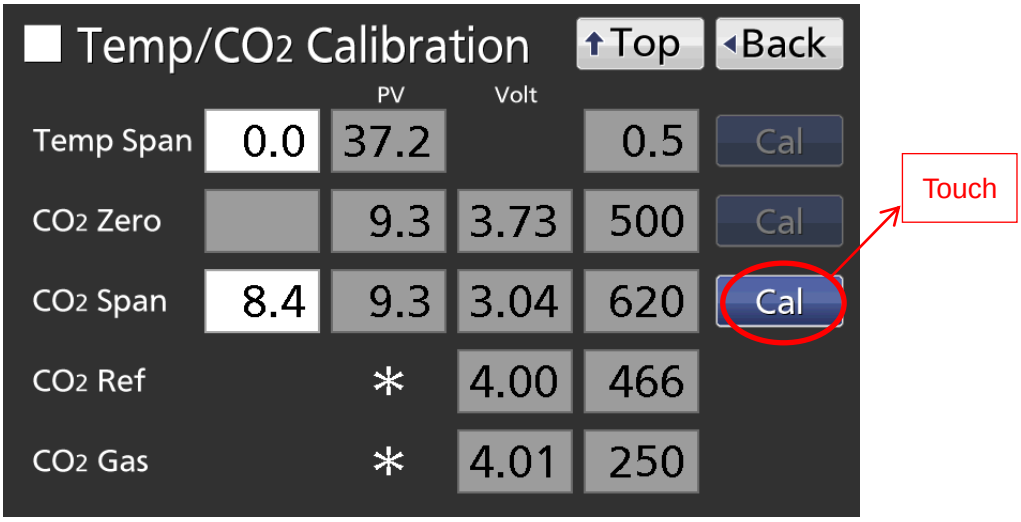


CO_2 PV value

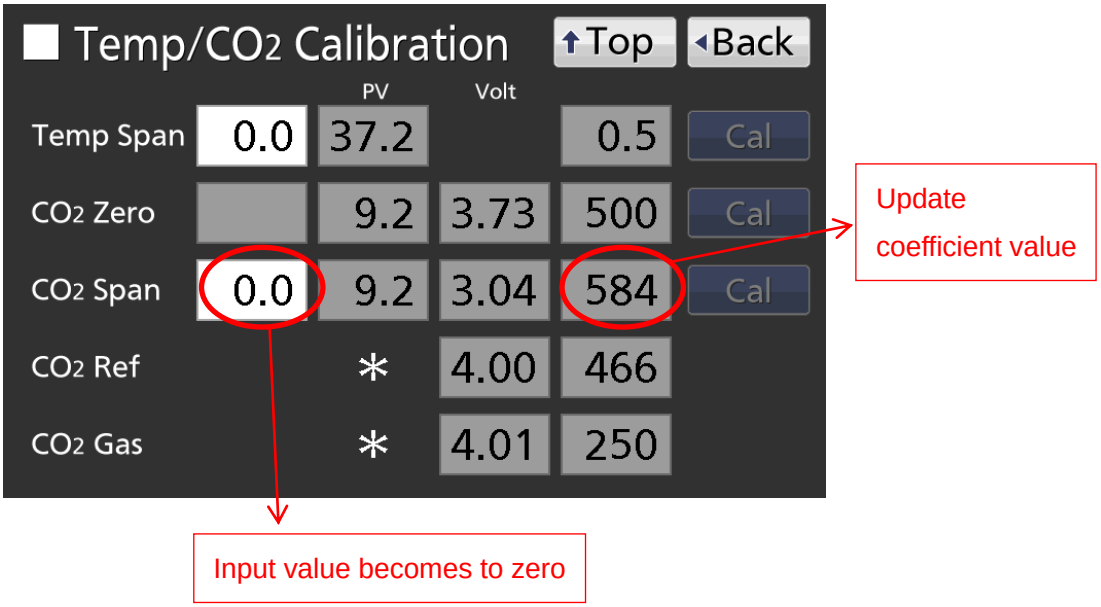
CO_2 span calibration coefficients

Input CO_2 density (acceptable range is CO_2 PV value ±1%)
This box is valid only if CO_2 set value is more than 2.0% and CO_2 PV value is between 0.9% and 22.0%. If not, invalid.

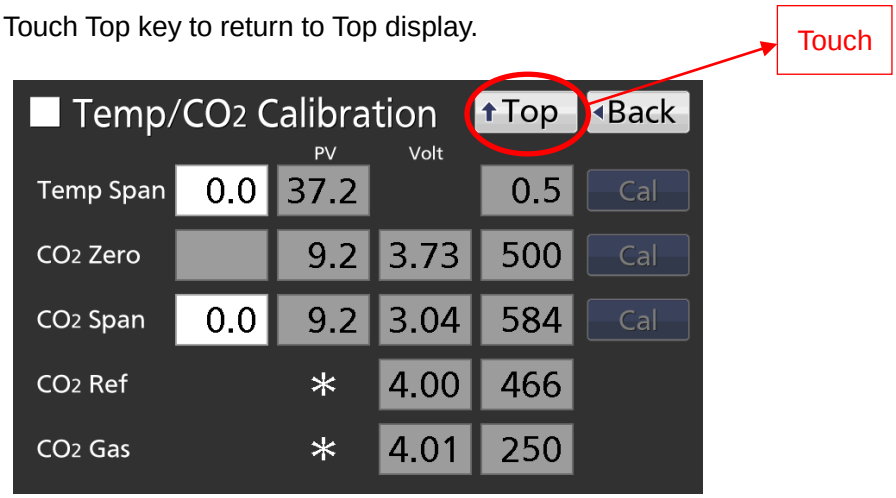
2. When input value is acceptable, Cal key becomes active and so touch it.



3. CO_2 span calibration coefficient is updated.



4. Touch Top key to return to Top display.



CO_2 sensor zero calibration procedures

Notes before adjustment

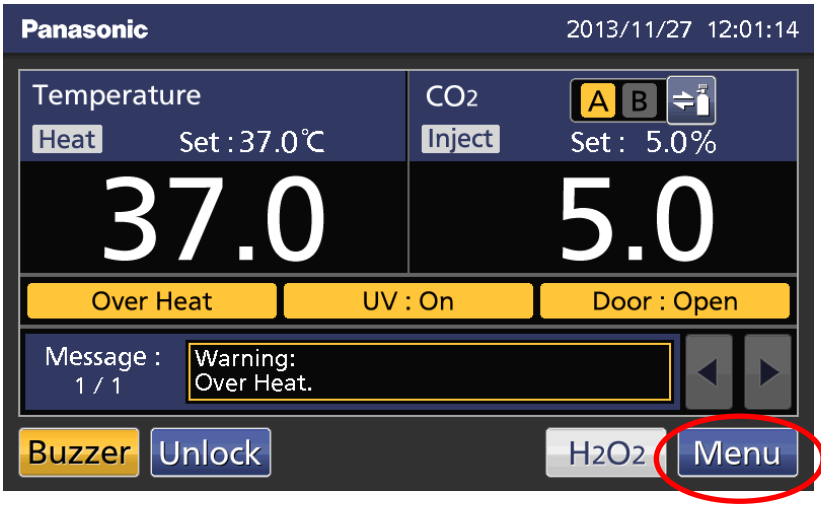
- Make stable chamber temperature, CO_2 sensor box temperature (45℃±2℃) and CO_2 set value (0.0%).
- Make sure there is no CO_2 gas in chamber.
  * When you do re-adjustment, open the door and make sure there is no CO_2 gas in chamber.

1. Keep touching Menu key at Top display, then input service code to show Service display.
2. Touch CO_2: 0% Adjustment key at Service display to start 4V adjustment system check.
3. After completing system check, 4V automatic adjustment is operated.
4. After completing automatic adjustment, press SAVE key, then press OK key to return to Top display and touch Menu key.
5. Select Tools#1 and touch Temp./CO_2 Calibration key.
6. Touch “0.1%” at right side of “CO_2 Zero” at calibration display and input “0.0”.
7. Cal key at right side of CO_2 Zero become active, so touch Cal key.
8. End of CO_2 sensor zero adjustment.

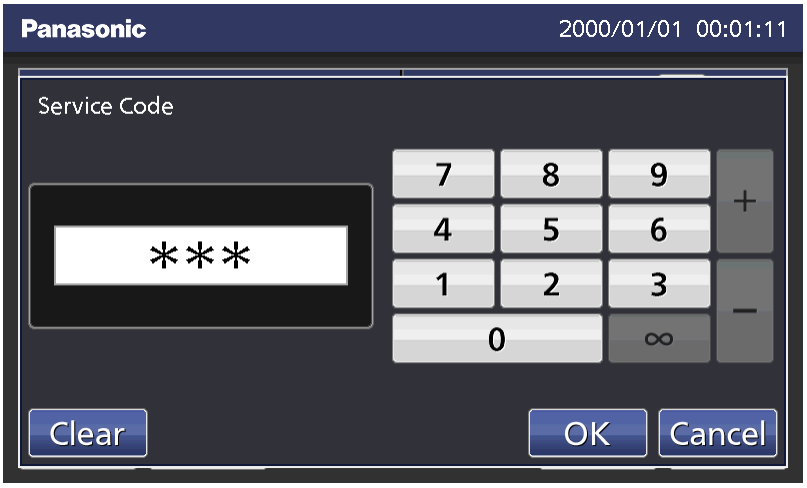
* Refer to following pages for details of 4V adjustment.

4V adjustment

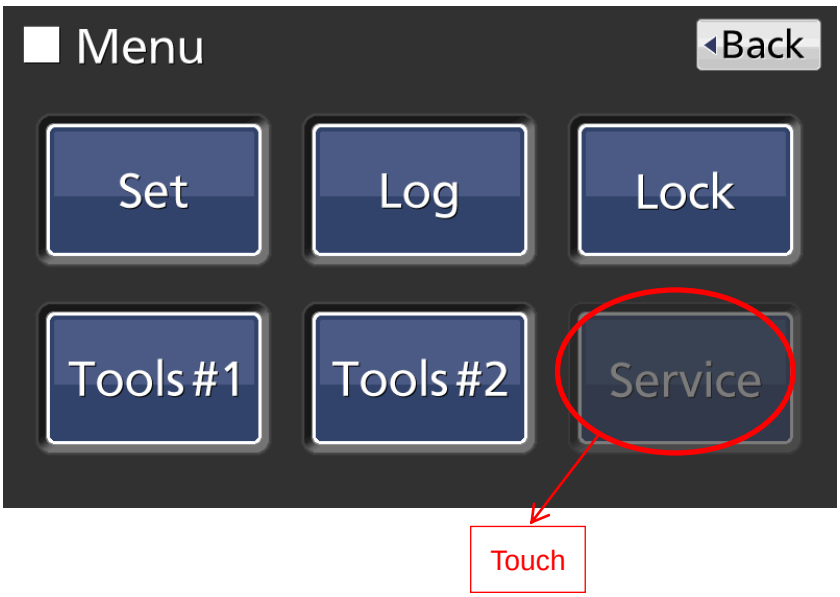
1. Keep touching Menu key (5 seconds) at Top display.



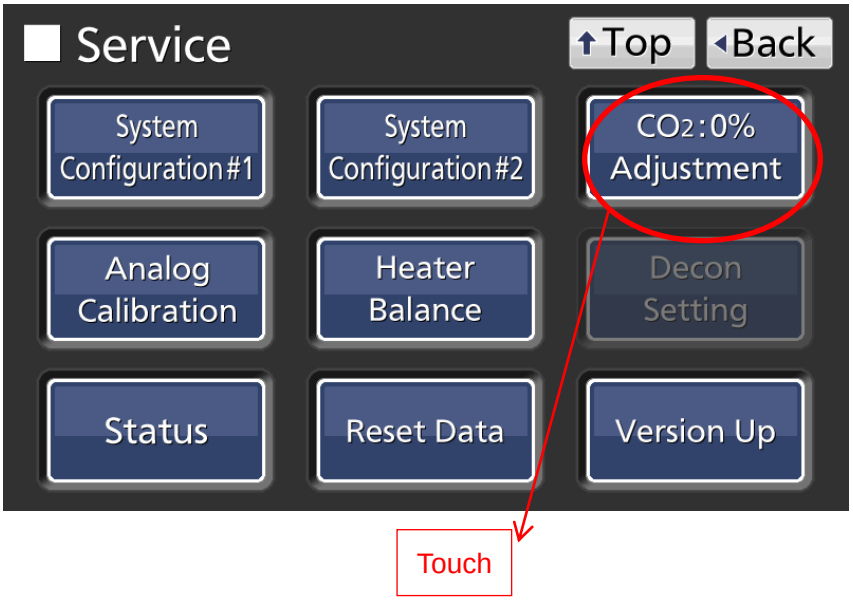
2. Move to service code input display, so input “384”.



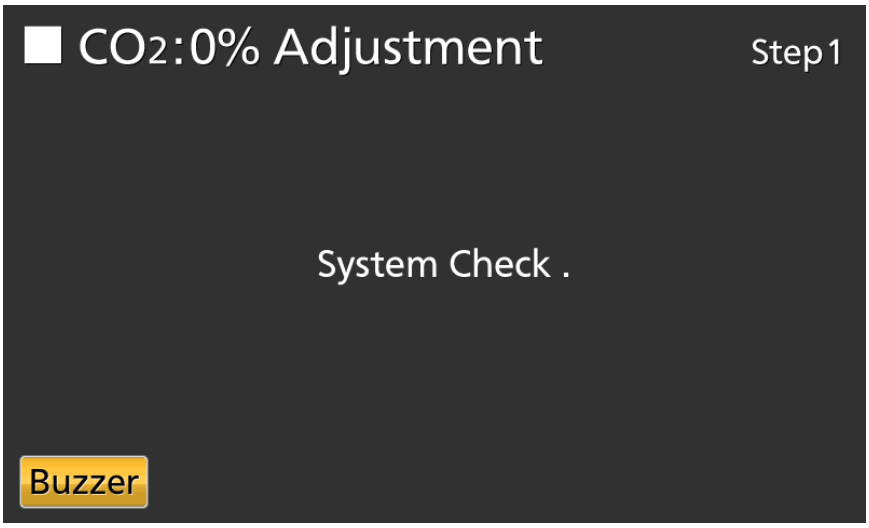
3. Touch Service key at Menu display.



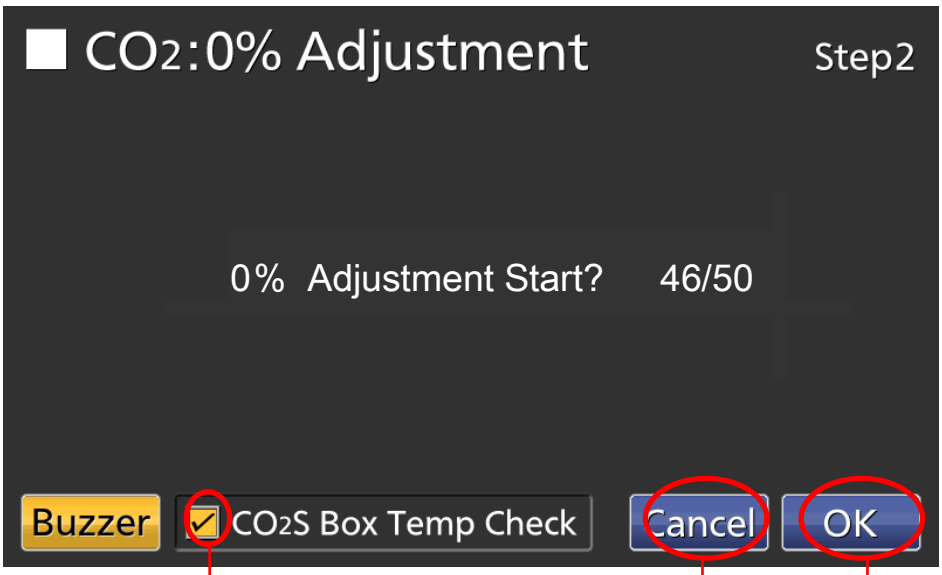
4. Touch CO_2: 0% Adjustment key at Service display.



5. Start 4V adjustment system check.



6. When it proceeds to Step 2, touch OK key.

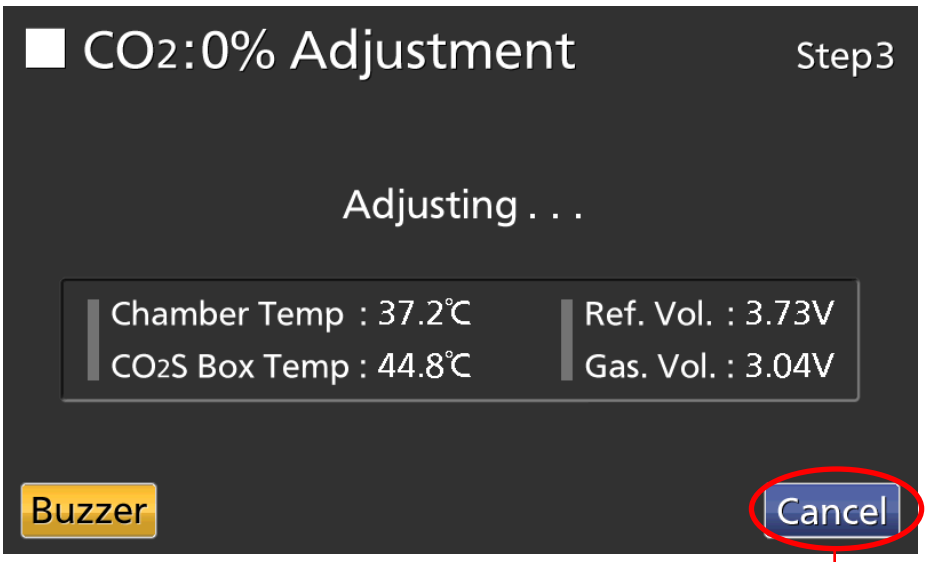


When check the box: wait for CO_2 sensor box temp. become stable. Wait for temp. stable: make sure temp. is in the range of 45℃±1℃ for 90 minutes continuously.

Return to Service display

Operate 4V adjustment

7. It adjusts electric volume automatically and make its voltage to 4V.

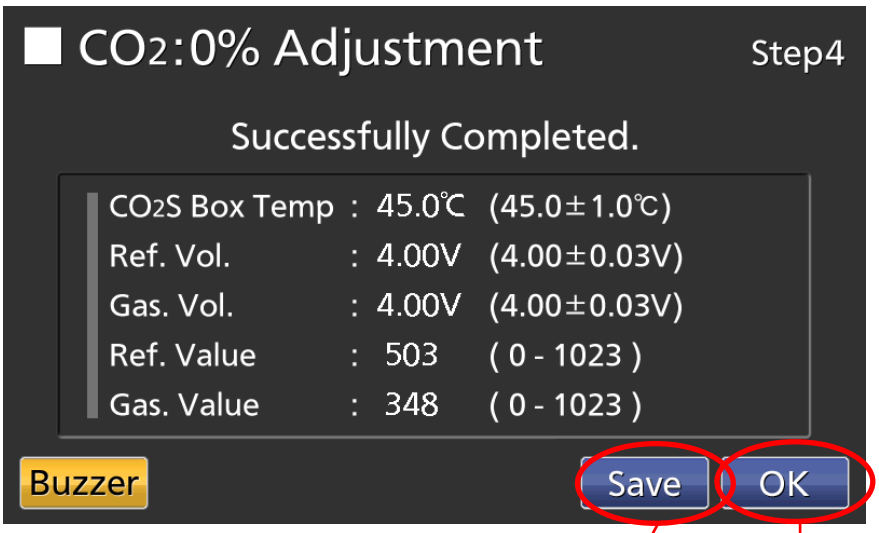


Stop adjustment.
Return to Service display.

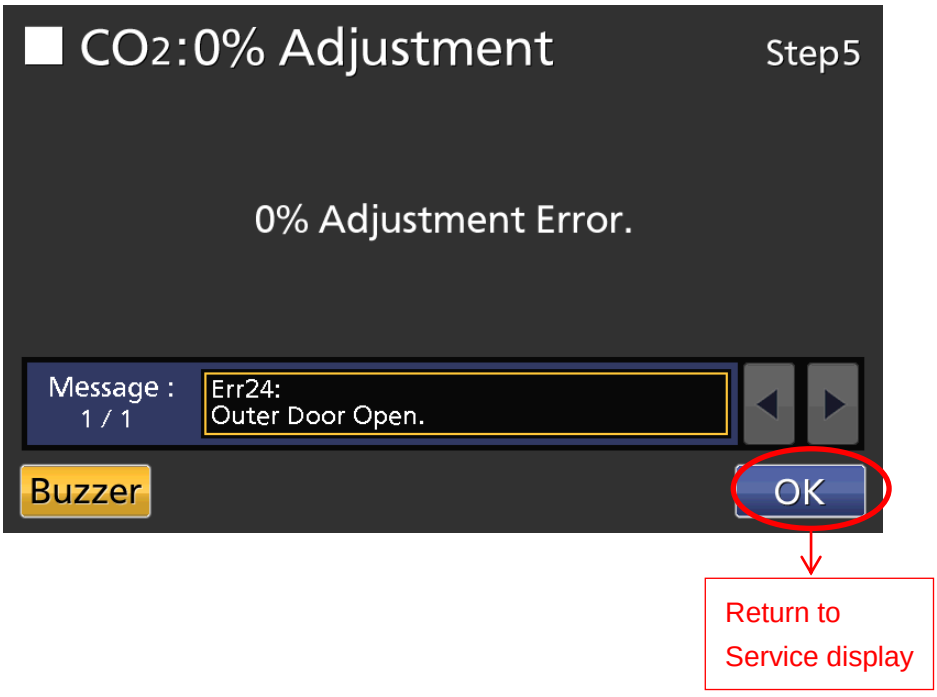
8. When the adjustment is completed correctly, below display is showed.

If you save adjustment result, touch Save key.

If you touch OK key, return to Service display.

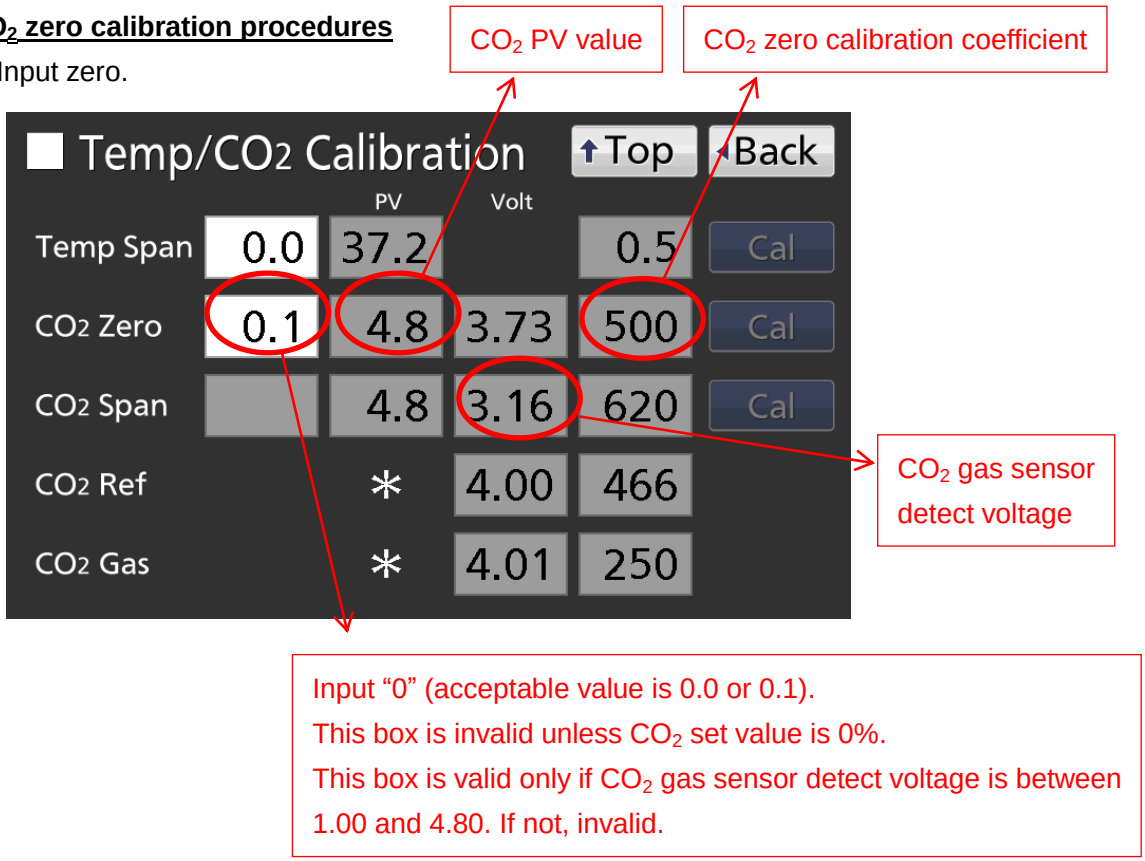


9. If error is occurred, below display is showed.

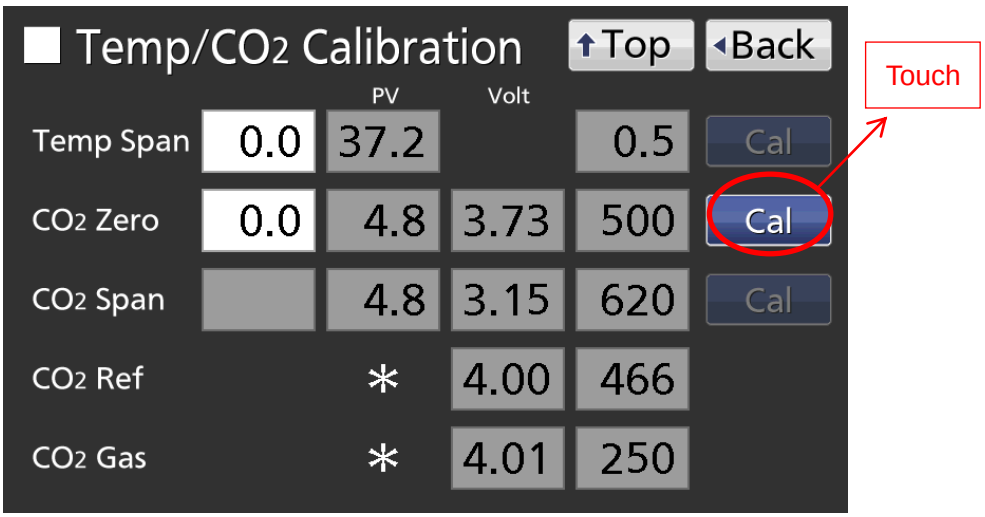


CO_2 zero calibration procedures

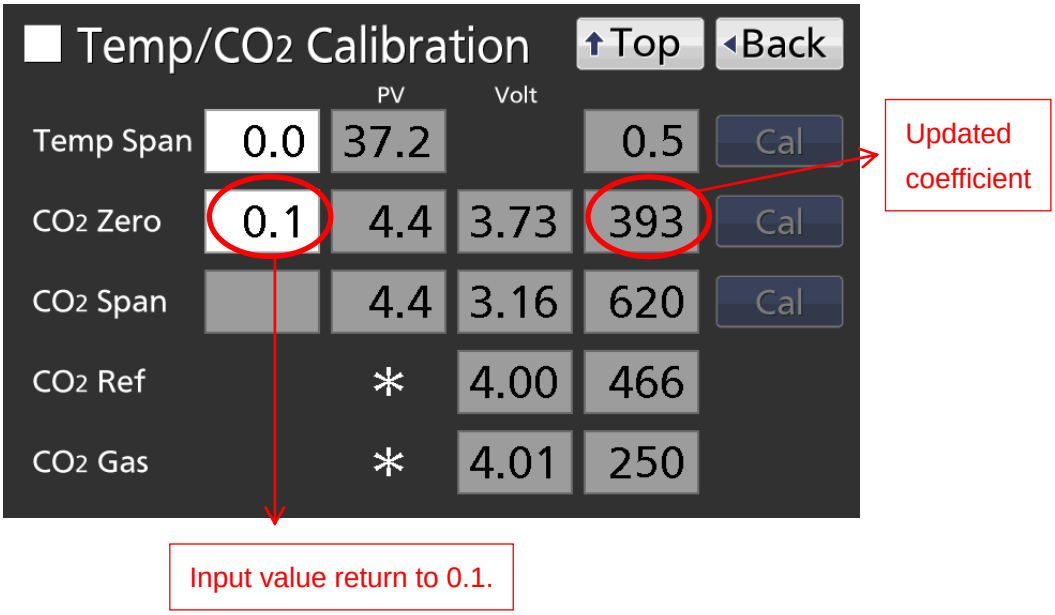
1. Input zero.



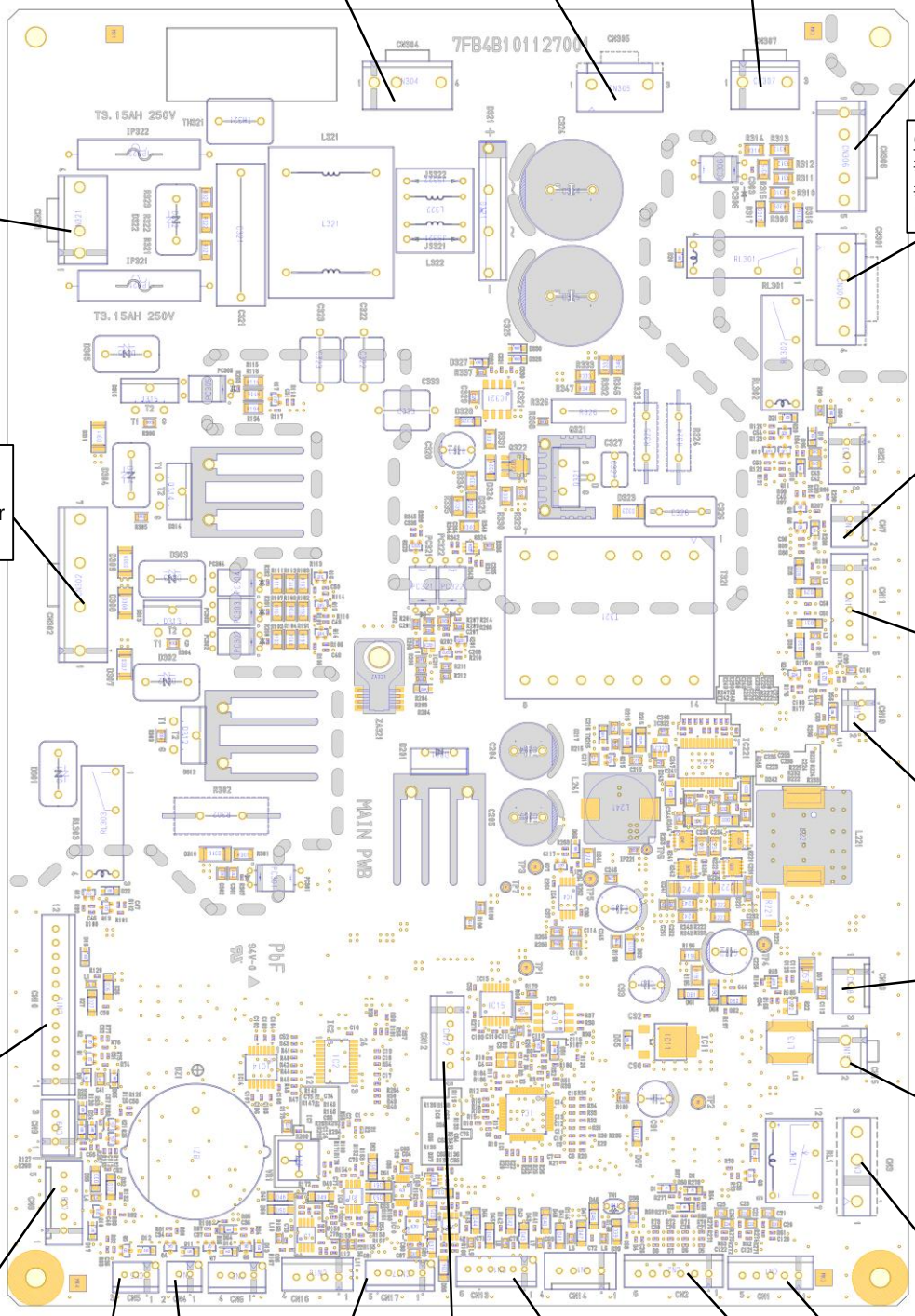
2. If “0” is input, Cal key become active, so touch Cal key.



3. CO_2 zero calibration coefficient is updated.



Components on PCB



CN304
#2, #4
CO_2 box heater

CN305
#1, #3
Power supply
for decontamination

CN307
#1, #3 Glow starter

CN306
#1, #2, #4, #5
UV lamp

CN321
#1, #4
Power supply
switch

CN301
#1, #3 for -A model
#1, #3, #4 for -E model
Ballast

CN7
#1, #2
Relay for
generator

CN302
#1-#7 Main heater
#3-#7 Bottom heater
#5-#7 Door heater

CN11
#1-#2
Temp.
heater
(option)
#3-#6
MCO-HP
(option)

CN19
#1-#2 DC fan

CN18
#2-#3
Peltier element

CN10
#5-#6
Buzzer (CN403)
#8-#9
Door switch
#10-#11
Electric lock
(option)

CN15
#1-#2
Ceramic heater

CN3
Remote alarm
terminal
#1 COM.
#2 N.O.
#3 N.C.

CN8
#1-#2 Standard gas valve
#3-#4 Standard gas pressure
sensor

CN4
#1-#2
CO_2 valve

CN12
#1-#5
Connector for emulator

CN2
#1-#6
MTR-480
MTR-L03
(option)

CN1
#1-#5
MCO-420MA
(option)

CN5
#1-#2
CO_2 auto exchanger
valve (option)

CN17
#1-#5
CO_2 sensor PCB

CN13
#1-#2 CO_2 box temp. sensor
#3-#4 Temp. sensor
#5-#6 Overheat protect sensor

Connections on PCB

■Connections to each connector on PCB.

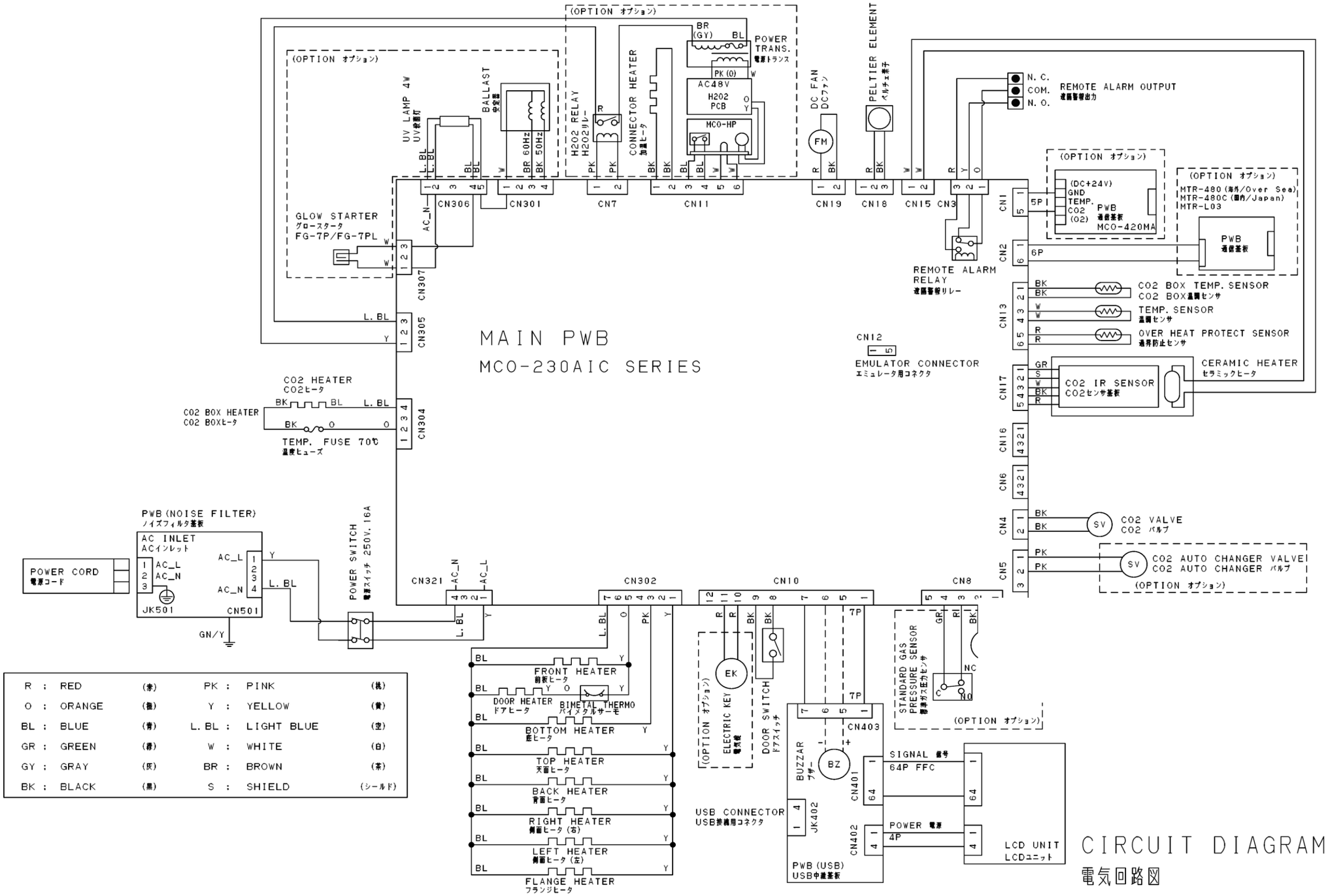
Connector	Connection to	Usage
CN1	#1- #5 MCO-420MA (option)	Connect to option
CN2	#1- #6 MTR-480/MTR-L03 (option)	Connect to option
CN3	Remote alarm terminal #1 COM #2 N.O. #3 N.C.	Remote alarm contact output
CN4	#1- #2 CO_2 valve (DC24V)	Control CO_2 valve ON/OFF
CN5	#1- #2 CO_2 auto exchanger valve (option)	
CN7	#1- #2 Relay for H_2O_2 decontamination PCB (DC24V)	
CN8	#1- #2 Standard gas valve (DC24V) #3- #4 Standard gas pressure sensor	
CN10	#5- #6 Buzzer (CN403) #8- #9 Door switch #10- #11 Electric lock (DC24V)(option)	Detect door opened
CN11	#1- #2 Temp. heater (option) #3- #6 MCO-HP (option)	Connect to option
CN12	#1- #5 Connector for emulator	
CN13	#1- #2 CO_2 box temp. sensor #3- #4 Temp. sensor #5- #6 Overheat protect sensor	Detect temp. of each part
CN15	#1- #2 Ceramic heater	
CN17	#1- #5 CO_2 sensor PCB	Control CO_2 density
CN18	#2- #3 Peltier device	
CN19	#1- #2 DC fan	
CN301	#1, #3 for –A model #1, #3, #4 for –E model Ballast	
CN302	#1- #7 Main heater #3- #7 Bottom heater #5- #7 Door heater	Control each heater
CN304	#2, #4 CO_2 box heater	
CN305	#1, #3 Power supply for decontamination	
CN306	#1, #2, #4, #5 UV lamp	
CN307	#1, #3 Glow starter	
CN321	#1, #4 Power supply switch	Supply power to PCB

Electric Parts

MCO-230AIC-** / MCO-230AICUV-** / MCO-230AICUVH-**

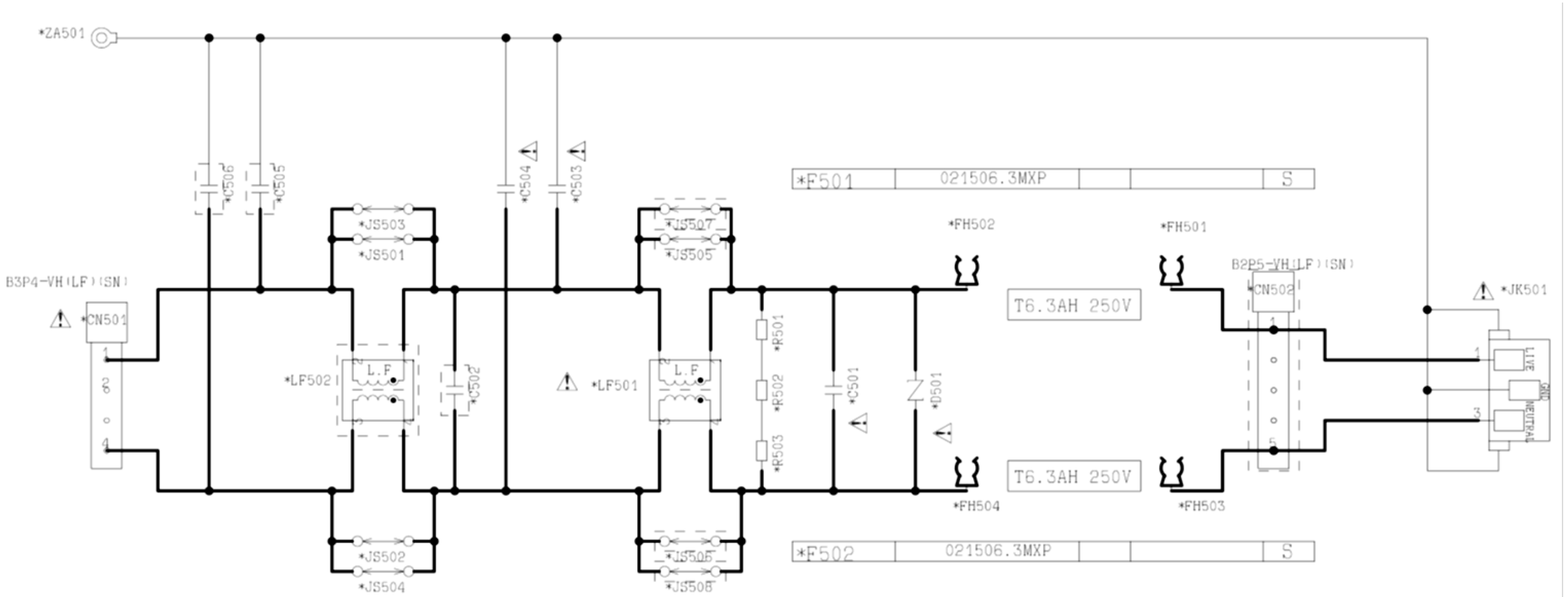
	AC115V 60Hz	AC220-240V 50Hz
Fan motor	DG8-013S12M	DG8-013S12M
	DC12V 1.5W	DC12V 1.5W
Temp. fuse 70℃	SF70U	SF70U
	250V, 7A	250V, 7A
Top heater	AC115V, 12W	AC230V, 12W
Bottom heater	AC115V, 69W	AC230V, 71W
Side heater (R)(L)	AC115V, 30W	AC230V, 30W
Back heater	AC115V, 26W	AC230V, 26W
Front panel heater	AC115V, 50W	AC230V, 50W
Door heater	AC115V, 65W	AC230V, 67W
CO_2 heater A	AC115V, 23W	AC230V, 23W
Frange heater	AC115V, 40W	AC230V, 41W
Ceramic heater	DC5V	DC5V
CO_2 sensor	IR sensor	IR sensor
	ETS E21 F3.91/F4.26	ETS E21 F3.91/F4.26
Over heat protect sensor	103AT-11	103AT-11
	10KΩ,25℃	10KΩ,25℃
Temp. sensor	103AT-11	103AT-11
	10KΩ,25℃	10KΩ,25℃
CO_2 Box temp. sensor	103AT-11	103AT-11
	10KΩ,25℃	10KΩ,25℃
Bimetal thermo	TH-2	TH-2
	ON:60℃ OFF:70℃	ON:60℃ OFF:70℃
Ballast	EKF-04115B1	EKF-0423A22B1
＜option for 230AIC＞	4W, 115V, 60Hz	4W, 230/220V, 50/60Hz
UV lamp	GL4	GL4
＜option for 230AIC＞	4W	4W
Glow starter	FG-7PL	FG-7PL
＜option for 230AIC＞		
Power switch	16A、250VAC、	16A、250VAC、
Door switch	SS160-A15	SS160-A15
	28V, 50MA	28V, 50MA
CO_2 valve	FAB11-X2265	FAB11-X2265
	DC24V	DC24V
CO_2 auto changer valve	FAB11-X2265	FAB11-X2265
(MCO-21GC)＜option＞	DC24V	DC24V
H_2O_2 relay	G2R-1A-T	G2R-1A-T
(MCO-HP))	24V, 10A, 250V	24V, 10A, 250V
＜option for 230AIC＞		
Standard gas valve	SPS-35	SPS-35
(MCO-SG)＜option＞		
Electric key	LE-36	LE-36
(MCO-170EL)	DC24V	DC24V
＜option for 230AIC＞		

Wiring Diagram

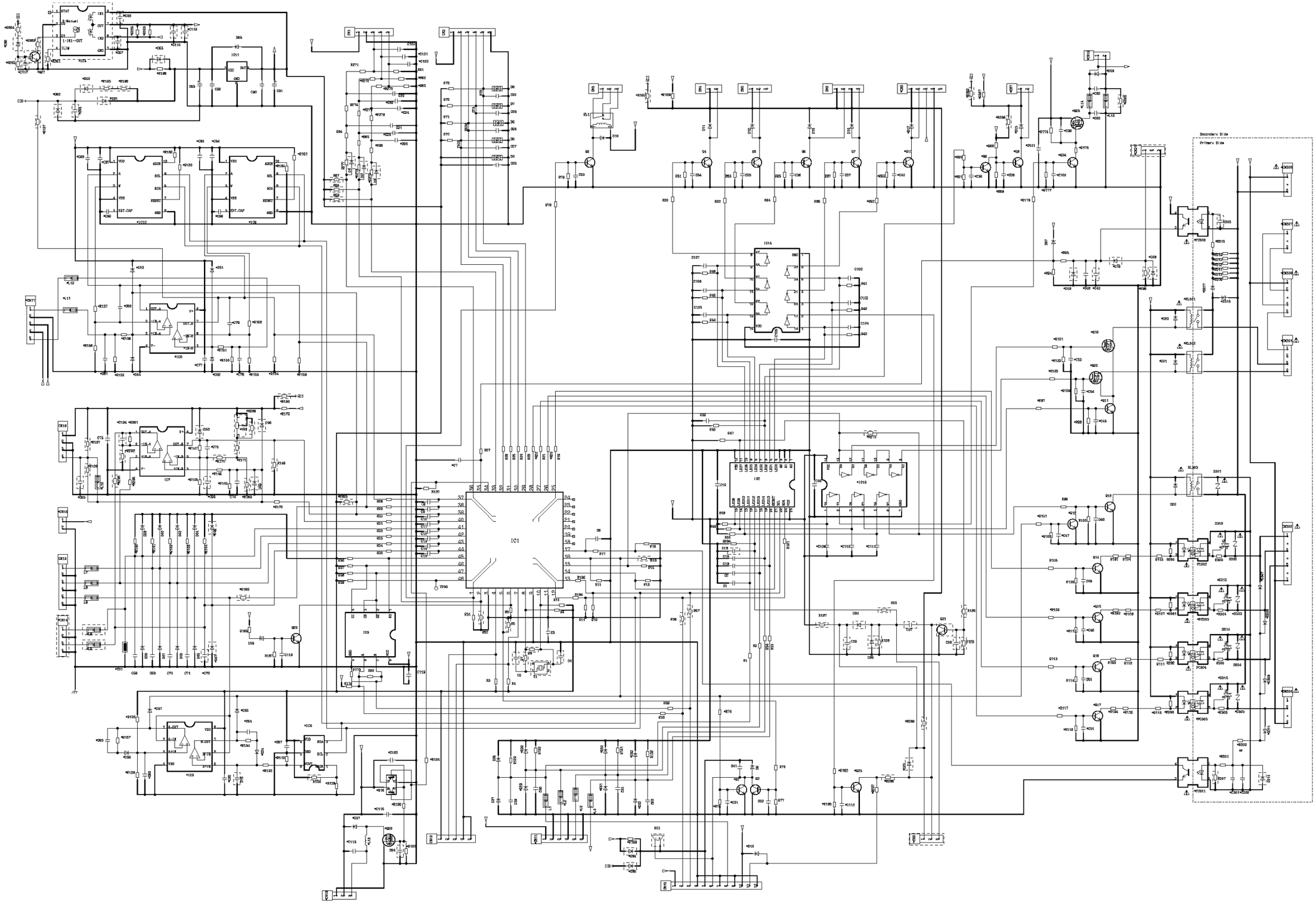


Circuit Diagram

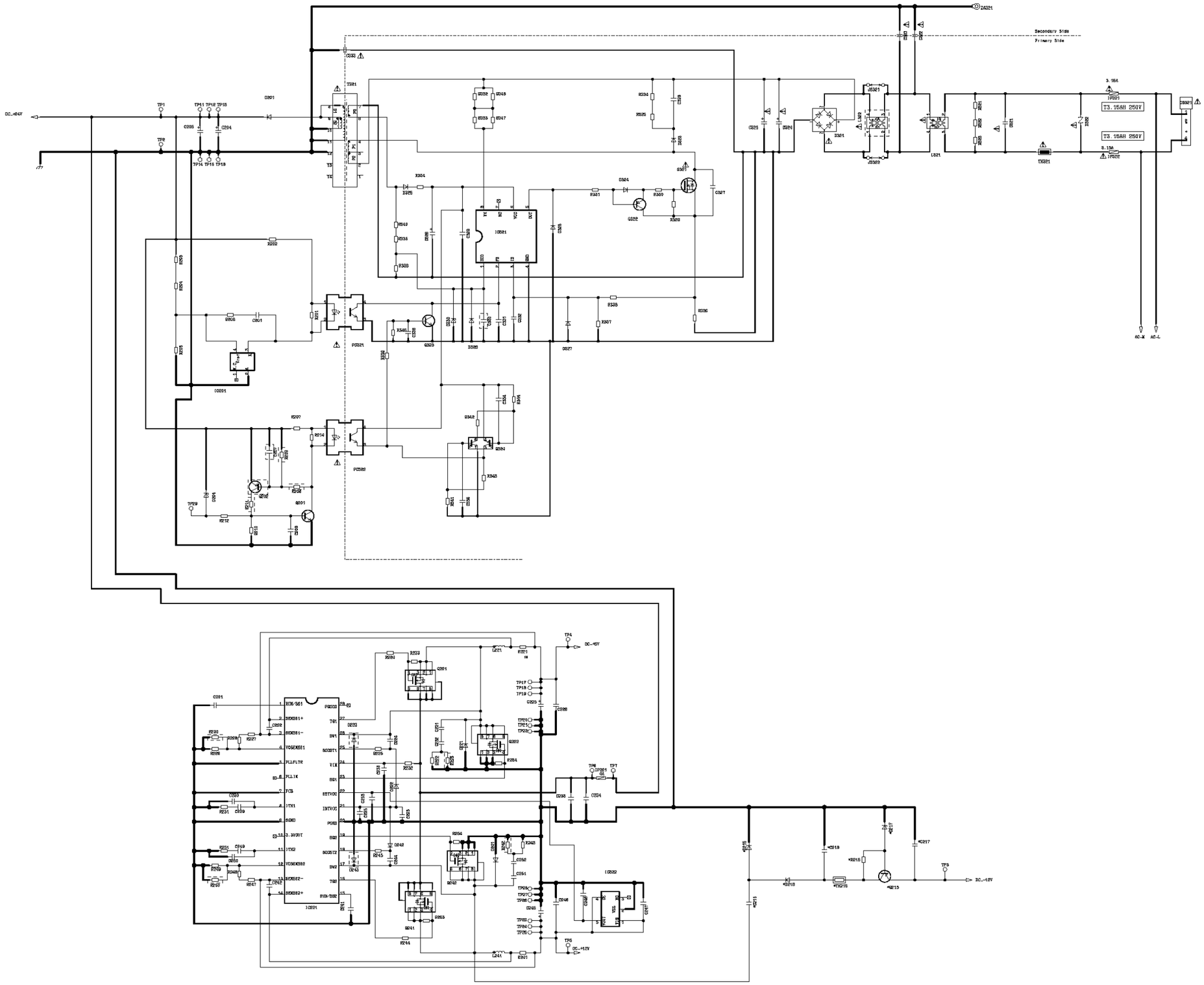
Filter Circuit



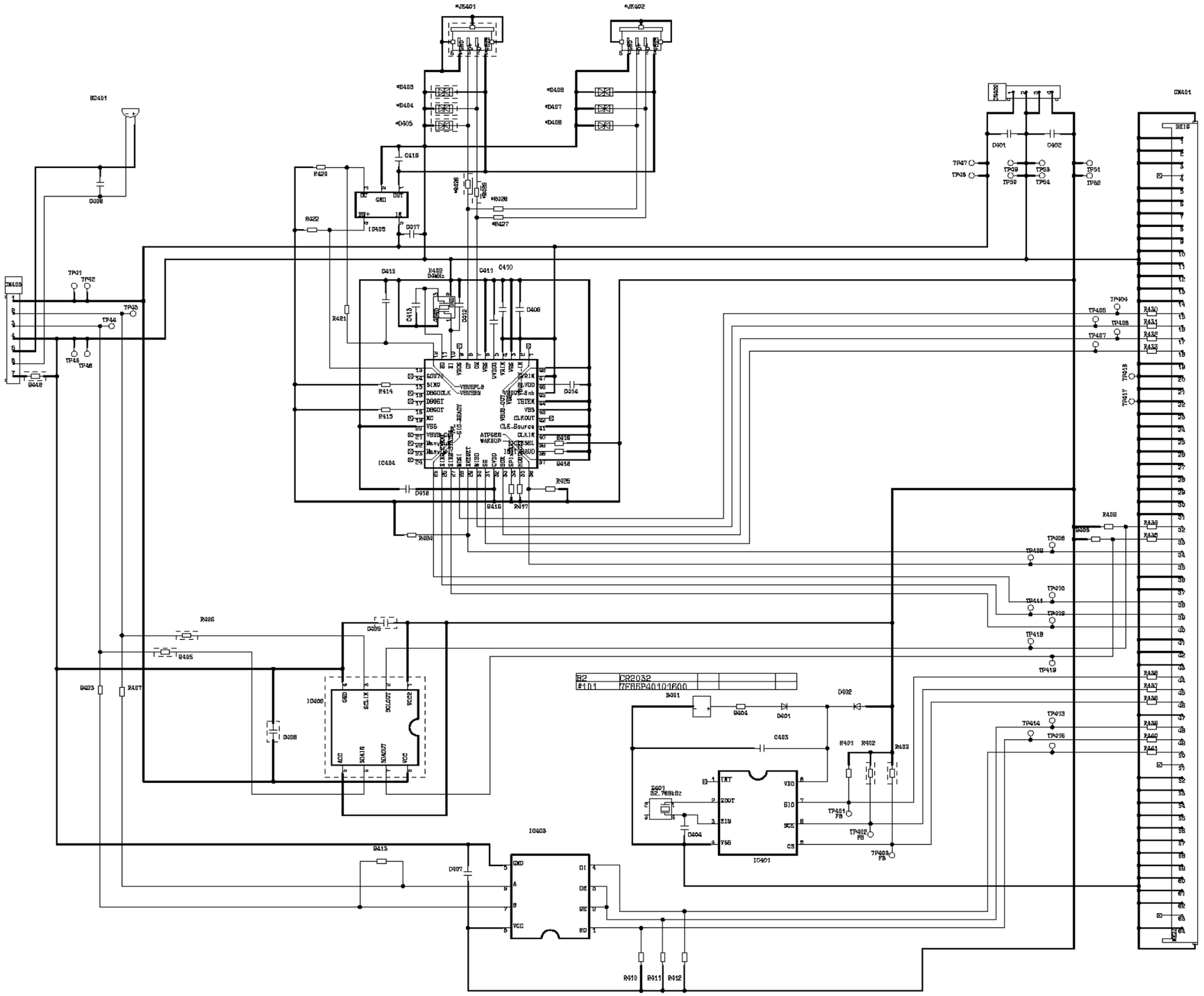
Mein curcuit 1



Mein curcuit 2



USB Circuit


*JK401
*JK402
*D405
*D404
*D406
*D407
*D408
C416
R420
*R426
*R427
*R428
R422
D405
D406
C417
C415
R421
C411
C410
C412
D409
IC404
R414
R415
R416
R417
R425
D410
D411
R418
C418
R402
R406
R405
R423
R407
D408
IC406
R2
CR2032
#101
7FB6P4010600
R401
R404
D401
D402
C403
R401
R402
R403
X401
32.768kHz
C404
IC401
TP401
FB
TP402
FB
TP403
FB
IC403
R413
D407
R410
R411
R412
CN401
D401
D402
TP407
TP408
TP50
TP53
TP54
TP51
TP52
TP409
TP405
TP406
R430
R431
R432
R433
TP418
TP417
R408
D403
TP408
TP410
TP411
TP412
TP413
TP414
TP415
TP416
R436
R437
R438
R439
R440
R441
CN402
TP41
TP42
TP43
TP44
TP45
TP46
R412

Control specifications

1. Temperature control (Main heater)

(1) Chamber temp. setting range: 0.0℃~50.0℃ (Default: 37.0℃)
(2) Alarm setting range: set temp.±1.0℃~±5.0℃ (Default: ±1.0℃)
(3) Alarm delay time: 0 min.~15 min. (Default: 15 min.)
(4) Chamber temp. setting method:
At Top Screen, select Set using MENU key to show Stand-by Setting display. Move the cursor to temp. setting and set the value using numerical key. Select OK using MENU key and press Enter key to store the set value.

2. Bottom heater control

(1) Following calculation is carried out against PWM value of main heater output.

PWM value of main heater output × (((bottom heater balance set value – 10) × 0.05) + correction factor)

Correction factor:
- Deviation of chamber temp. and ambient temp. is 8.0℃ or less.
(temp. deviation × 0.0197) + 0.33667
- Deviation of chamber temp. and ambient temp. is over 8.0℃.
(temp. deviation × 0.01187) + 0.3933

(2) Limit max. output 90% (PWM value = 270/300) or less.
(3) During H_2O_2 decontamination and UV decomposition, ON/OFF controlled at max. output 270 regardless of main heater output.

3. Door heater control

(1) Following calculation is carried out against PWM value of main heater output when chamber temp. exceed lower limit of proportional band.

PWM value of main heater output × (((door heater balance set value – 4) × 0.1) + correction factor)

Correction factor:
- Deviation of chamber temp. and ambient temp. is 8.0℃ or less.
(temp. deviation × (-0.04375)) + 1.43125
- Deviation of chamber temp. and ambient temp. is over 8.0℃.
(temp. deviation × 0.01453) + 0.965

(2) If deviation of chamber temp. and set temp. is exceeded 7.0℃ and decreas, duty factor is following.

PWM value of main heater output × 0.7

(3) During H_2O_2 decontamination and UV decomposition, ON/OFF controlled at max. output 300 regardless of main heater output.

4. CO_2 density control

(1) Chamber CO_2 setting rang: 0.0%~20.0% (Default: 0.0%)
* Do not control density with 0.0% setting.
(2) Alarm setting range: set density ±0.5%~±5.0% (Default: ±1.0%)
(3) Alarm delay time: 0 min.~15 min. (Default: 15 min.)
(4) Chamber CO_2 density setting method:
At Top Screen, select Set using MENU key to show Stand-by Setting display. Move the cursor to CO_2 density setting and set the value using numerical key. Select OK using MENU key and press Enter key to store the set value.

5. Alarms and self-diagnosis function

(1) Over heat protection alarm
Setting range: 20℃~53℃
If chamber temp. exceed set value, turn on upper limit temp. display lamp (OVER HEAT).
Buzzer sounds consectively and remote alarm come out.

(2) Auto set temperature alarm

Setting range: set value ±1.0℃~±5.0℃ (Default: ±1.0℃)

If chamber temp. is out of alarm set range, current chamber temp. blinks.

Following alarm message is shown in message box after set alarm delay time is passed.

High temp. alarm: “Warning:High Temp”

Low temp. alarm: ”Warning:Low Temp“

Buzzer sounds intermittently and remote alarm come out.

(3) Auto set CO_2 density alarm

Setting range: set value ±0.5%~±5.0% (Default: ±1.0%)

If chamber CO_2 density is out of alarm set range, current chamber CO_2 density blinks.

Following alarm message is shown in message box after set alarm delay time is passed.

CO_2 high density alarm: “Warning:High CO_2 Density”

CO_2 low density alarm: “Warning:Low CO_2 Density”

Buzzer sounds intermittently and remote alarm come out.

(4) Auto return

If there is no key operation for 90 seconds in each setting mode, setting mode is closed and return to Top display.

(5) Key lock

When key lock setting is ON and press “Menu” key, pass word input display is shown.

If input pass word is wrong, it cannot be moved to setting mode and return to Top display.

(6) Door alarm

Door alarm delay time setting range: 1 min.~30 min. (Default: 2 min.)

When the outer door is opened, following message is shown in status box.

When the outer door is opened: “Door: Open”

Buzzer sounds intermittently after set door alarm delay time.

Ring back does not work for door alarm.

(7) CO_2 gas empty

When the CO_2 valve is opened but CO_2 density rising is 0.2% or less three times in a row, following error message is shown in message box.

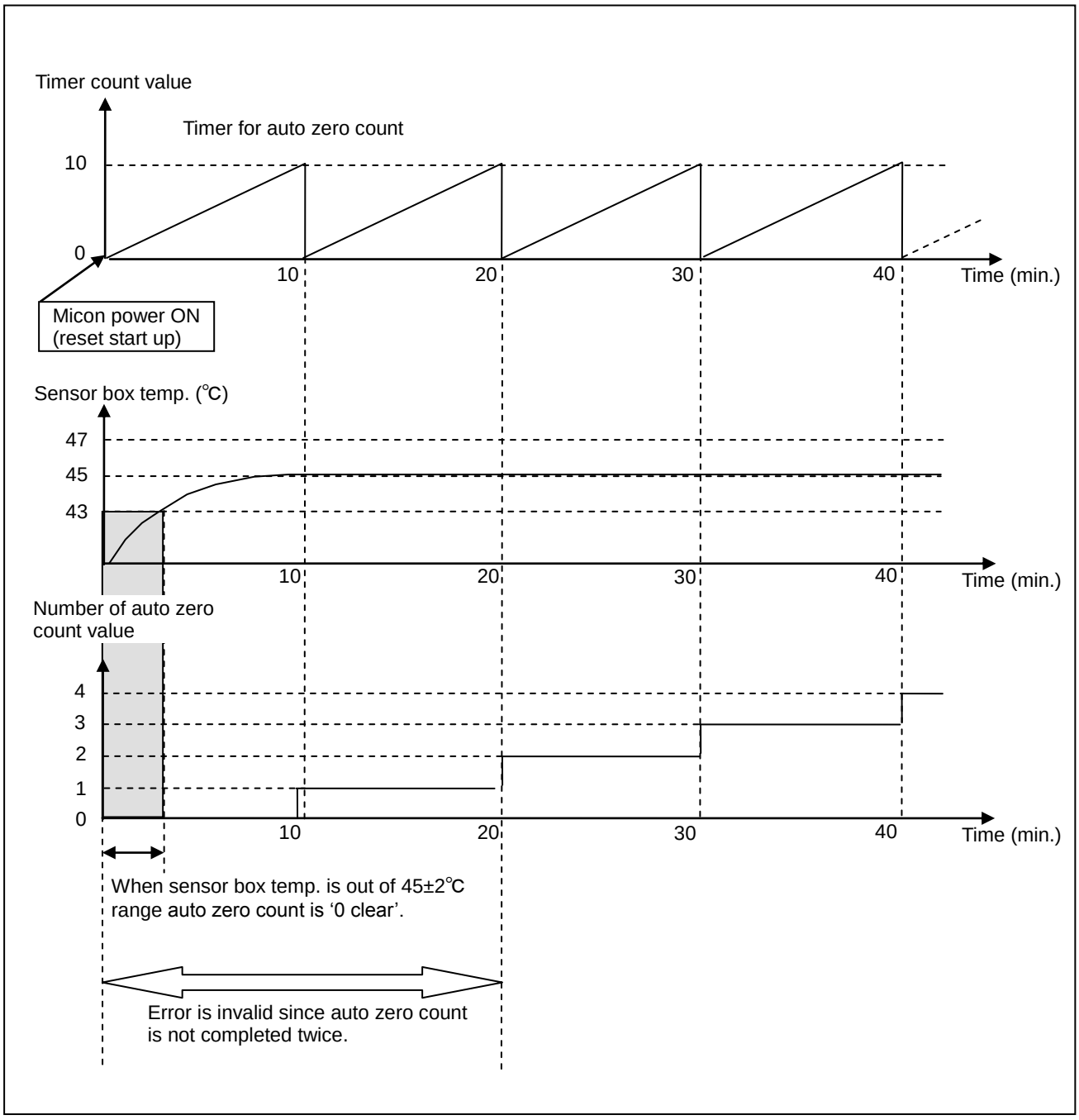
CO_2 gas empty error occurs: “Err01: CO_2 Gas Empty”

Buzzer sounds intermittently and remote alarm come out.

If CO_2 gas auto exchanger option is set, CO_2 gas supply line is automatically exchange A to B (B to A).

CO_2 gas supply cylinder indication of emptied one blinks.

* After sensor box temp. recovers to the range of 45℃±2℃, it is invalid until auto zero count become ‘complete twice (11~20 min.)’.



(8) Chamber temp. sensor is abnormal

If chamber temp. sensor is open circuit or short circuit, following error message is shown in message box

Open circuit: “Err05: Temp Sensor Open.”

Short circuit: “Err06: Temp Sensor Short.”

Buzzer sounds intermittently and remote alarm come out.

Temp. is 0.0℃ or less: Judged as open circuit.

Temp. is more than 60℃: Judged as short circuit.

(9) Sensor box temp. sensor abnormal

If sensor box temp. sensor is open circuit or short circuit, following error message is shown in message box.

Open circuit: “Err07: CO_2 Box Temp Sensor Open.”

Short circuit: “Err08: CO_2 Box Temp Sensor Short.”

Buzzer sounds intermittently and remote alarm come out.

Temp. is 0.0℃ or less: Judged as open circuit.

Temp. is more than 60℃: Judged as short circuit.

(10) Ambient temp. sensor abnormal

If ambient temp. sensor is open circuit or short circuit, following error message is shown in message box.

Open circuit: “Err09: AT Sensor Open.”

Short circuit: “Err10: AT Sensor Short.”

Buzzer sounds intermittently and remote alarm come out.

Temp. is 0.0℃ or less: Judged as open circuit.

Temp. is more than 60℃: Judged as short circuit.

(11) CO_2 sensor abnormal

If CO_2 sensor standard voltage (Vref voltage) or gas density measuring voltage (Vgas voltage) becomes abnormal voltage, following error message is shown in message box.

CO_2 sensor Vref voltage abnormal: “Err11:CO_2 Sensor Vref Abnormal.”

CO_2 sensor Vgas voltage abnormal: “Err12:CO_2 Sensor Vgas Abnormal.”

Buzzer sounds intermittently and remote alarm come out.

Vref: Judged as abnormal votage if it is less than 3.0V or more than 4.8V.

Vgas: Judged as abnormal voltage if it is less than 1.0V or more than 4.8V.

* After sensor box temp. recovers to the range of 45℃±2℃, it is invalid until auto zero count become ‘complete twice (11~20 min.)’.

(12) Main heater abnormal

If main heater is open circuit or SSR is short circuit, following error message is shown in message box.

Main heater abnormal: “Err13: Main Heater Abnormal.”

Buzzer sounds intermittently and remote alarm come out.

Only main heater is turned off and if heater SSR self-diagnosis input is ‘High’, judged as abnormal.

(13) Bottom heater abnormal

If bottom heater is open circuit or SSR is short circuit, following error message is shown in message box.

Bottom heater abnormal: “Err14: Humidty Heater Abnormal.”

Buzzer sounds intermittently and remote alarm come out.

Only bottom heater is turned off and if heater SSR self-diagnosis input is ‘High’, judged as abnormal.

(14) Door heater abnormal

If door heater is open circuit or SSR is short circuit, following error message is shown in message box.

Door heater abnormal: “Err15: Door Heater Abnormal.”

Buzzer sounds intermittently and remote alarm come out.

Only door heater is turned off and if heater SSR self-diagnosis input is ‘High’, judged as abnormal.

(15) Sensor box heater abnormal

If sensor box heater is open circuit or SSR is short circuit, following error message is shown in message box.

Sensor box heater abnormal: “Err16:CO_2 Box Heater Abnormal.”

Buzzer sounds intermittently and remote alarm come out.

Only sensor box heater is turned off and if heater SSR self-diagnosis input is ‘High’, judged as abnormal.

(16) SSR for each heater is short circuit

If SSR for each heater (main heater, bottom heater, door heater, sensor box heater) is open circuit, following error message is shown in message box.

SSR for each heater open circuit: “Err17: Heater SSR Open.”

Buzzer sounds intermittently and remote alarm come out.

All heater are turned on and if heater SSR self-diagnosis input is Low’, judged as abnormal.

(17) UV lamp failure

If UV lamp is blown out or UV lamp circuit is abnormal, following error message is shown in message box.

UV lamp failure: “Err18: UV Lamp Abnormal.”

Buzzer sounds intermittently and remote alarm come out.

If UV lamp is on and the average voltage after 25 sec.~29 sec. passed is less than 0.5V or more than 4.0V, judged as abnormal.

(18) Electric lock abnormal

If electric lock is locked and outer door is opened, following error message is shown in message box.

"Err20: Door Lock Failure"

Buzzer sounds intermittently and remote alarm come out.

(19) UV lamp is burn out

If lighting accumulation time of UV lamp reaches about 5000 hours, following message is shown in message box.

UV lamp burn out: "Warning: UV Bulb Life"

(20) Error during 4V adjustment

During 4V adjustment

1) If CO_2 sensor box temp. cannot be stable in the range of set temp. ±1℃ after 5 hours, following error message is shown.
   "Err23:CO_2 Box Temp Unstable"
2) If outer door is opend, following error message is shown.
   "Err24: Outer Door Open"
3) If capable data writing count (50 times) of CO_2 sensor Vref electric volume is all used and try to write data, following error message is shown.
   "Err25: Ref Vol. Write Max"
4) If capable data writing count (50 times) of CO_2 sensor Vgas electric volume is all used and try to write data, following error message is shown.
   "Err26: Gas Vol. Write Max"
5) If reading or writing to CO_2 Vref electric volume is failed, following error message is shown.
   "Err27: Ref Vol. Access Failure"
6) If reading or writing to CO_2 Vgas electric volume is failed, following error message is shown.
   "Err28: Gas Vol. Access Failure"
7) If the voltage of CO_2 Vref and CO_2 Vgas are not in the range of 4V±0.03V after 30 times adjustment process, following error message is shown.
   "Err29: 4V Adjust Retry Ended"
8) If CO_2 set density is not 0%, following error message is shown.
   "Err30: CO2 Density Setting Error"

(21) H_2O_2 decontamination system check error

When H_2O_2 decontamination satrts

1) H_2O_2 decontamination unit is not connected, following error message is shown.
   "Err31: H_2O_2 Unit Not Connected"
2) If H_2O_2 reagent is in short or H_2O_2 water level sensor is failure, following error message is shown.
   "Err32: Low H_2O_2 Level"
3) If the outer door is not closed, following error message is shown.
   "Err33: Outer Door Open"

(22) Error during H_2O_2 decontamination

During H_2O_2 decontamination

1) If extend set time by 15 min. but H_2O_2 spraying completion is not detected, following error message is shown.
   "Err34: H_2O_2 Volume"
2) If there is power failure, following error message is shown after recovery.
   "Err35: Power Failure"
3) If the outer door is opened, following error message is shown.
   "Err38: Door Lock Failure"

During UV decomposition

4) If the UV lamp is failure, following error message is shown.
   "Err36: UV Lamp Failure"
   If UV lamp is on and the average voltage after 25 sec.~29 sec. passed is less than 0.5V or more than 3.0V, judged as abnormal.
5) If there is power failure, following error message is shown.
   "Err37: Power Failure"
6) If the outer door is opened, following error message is shown.
   "Err38: Door Lock Failure"

(23) Standard gas calibration system check error

When standard gas calibration starts

1) If the standard gas is empty (detected by gas pressure SW), following error message is shown.
   "Err41: Std Gas Empty"

(24) Error during standard gas calibration
During standard gas injection
1) If the standard gas is empty (detected by gas pressure SW), following error message is shown.
"Err41:Stg Gas Empty"

6. Remote alarm / Remote alarm contact

(1) If remote alarm setting is not interlock with buzzer (default), remote alarm cannot be cancelled temporary by pressing buzzer key (alarm continue).
If the setting is interlock with buzzer, remote alarm interlocks with buzzer output.

Remote alarm terminal operation

	COM. – N.O.	COM. – N.C.
Normal condition	"Open"	"Close"
Alarm condition	"Close"	"Open"
Power failure	"Close"	"Open"

7. Error messages

Refer to LCD communicaton spec for error messages.

Unit condition	Error message
Over heat alarm	Warning:Over Heat
High temp. alarm	Warning:High Temp
Low temp. alarm	Warning:Low Temp
High CO_2 density alarm	Warning:High CO_2 Density
Low CO_2 density alarm	High CO_2 density alarm
High O_2 density alarm	Warning:High O_2 Density
Low O_2 density alarm	Warning:Low O_2 Density
UV bulb life burn out	Warning:UV Bulb Life
CO_2 gas empty	Err01:CO_2 Gas Empty
Chmber temp. sensor open circuit	Err05:Temp Sensor Open
Chmber temp. sensor short circuit	Err06:Temp Sensor Short
Sensor box temp. sensor open circuit	Err07:CO_2 Box Temp Sensor Open
Sensor box temp. sensor short circuit	Err08:CO_2 Box Temp Sensor Short
Ambient temp. sensor open circuit	Err09:AT Sensor Open
Ambient temp. sensor short circuit	Err10:AT Sensor Short
CO_2 sensor Vref voltage abnormal	Err11:CO_2 Sensor Vref Abnormal
CO_2 sensor Vgas voltage abnormal	Err12:CO_2 Sensor Vgas Abnormal
Main heater: open, SSR: short	Err13:Main Heater Abnormal
Bottom heater: open, SSR: short	Err14:Humidty Heater Abnormal
Door heater: open, SSR: short	Err15:Door Heater Abnormal
Sensor box heater: open, SSR: short	Err16:CO_2 Box Heater Abnormal
SSR for each heater: open	Err17:Heater SSR Open
UV lamp failure	Err18:UV Lamp Abnormal
Electric lock abnormal	Err20:Door Lock Failure
Wait for temp. become stable during 4V adjustment time-out	Err23:CO_2 Box Temp Unstable
Outer door open during 4V adjustment	Err24:Outer Door Open
Capable writing count of Ref ele. vol. is 0	Err25:Ref Vol. Write Max
Capable writing count of Gas ele. vol. is 0	Err26:Gas Vol. Write Max
Ref ele. vol. communication failed	Err27:Ref Vol. Access Failure
Gas ele. vol. communication failed.	Err28:Gas Vol. Access Failure
Process count is over during 4V adjustment	Err29:4V Adjust Retry Over
CO_2 density setting error	Err30:CO_2 Density Setting Error
H_2O_2 unit is not connected	Err31: H_2O_2 Unit No Connected
H_2O_2 reagent is in short, water level sensor is failure	Err32: Low H_2O_2 Level
Outer door open when H_2O_2 decontamination start	Err33:Outer Door Open
H_2O_2 amount abnormal	Err34: H_2O_2 Volume
Power failure during H_2O_2 decontamination	Err35:Power Failure
UV lamp failure during UV decomposition	Err36:UV Lamp Failure
Power failure during UV decomposition	Err37:Power Failure
Electric lock abnormal during decontamination	Err38:Door Lock Failure
Standard gas empty	Err41:Std Gas Empty

8. Ring back

(1) If buzzer output is cancelled temporary by pressing buzzer key during alarm or error condition, buzzer sounds again after set time is passed.
Ring back does not work for door alarm.

(2) Ring back time setting range:
0 min. (ring back is OFF), 1 min.~99 min. (default: 30 min.)

(3) Remote alarm output
If remote alarm setting is 'interlock with buzzer', remote alarm is interlocked with buzzer output (buzzer sounds again after set time is passed).

		Remote alarm setting	
		Not interlock with buzzer (default)	Interlock with buzzer
Ring back set time	1 min.~99 min. (ring back is ON)	Buzzer sounds again Remote alarm sounds continue	Buzzer sounds again Remote alarm sounds again
	0 min. (ring back is OFF)	Buzzer not sounds again Remote alarm sounds continue	Buzzer not sounds again Remote alarm not sounds again

9. Alarm delay time

(1) If alarm condition is continue, buzzer and remote alarm output after set time is passed.

(2) Alarm delay time setting range:
0 min. (immediately: no delay time), 1 min.~15 min. (default: 15 min.)

10. Analog output

(1) Following calculation is carried out against current chamber temperature.

((current chamber temp. - 25.00℃) / 25.00℃) × (200 – TEMP analog output adjusting set value) × 0.00907）× resolution

Chamber temp. analog output adjusting set value: default＝100
Resolution＝368

(2) Following calculation is carried out against current chamber CO_2 density.

(current chamber CO_2 density / 20.00%) × (200 - CO_2 analog output adjusting set value) × 0.00912）× resolution

Chamber CO_2 density analog output adjusting set value: default＝100
Resolution＝512

11. Functions

Function code	Function
019	Initialize CO_2 zero point / span calibration factor CO_2 zero point calibration factor＝500 CO_2 span calibration factor＝500
925	Initialize EEPROM memory

12. Humidity control pole

(1) Use input value of chamber set temp. (PV) and ambient temp. sensor (AT) as input value, calculate voltage 1 (formula 1) and voltage 2 (formula 2). Then set bigger voltage as peltier voltage.
[Formula 1] Voltage 1 = 0.066*(AT-23)+((0.0013*PV*PV)-(0.1487*PV)+4.2)
[Formula 2] Voltage 2 = (0.066+0.0051*(50-PV))*(AT-23)
However, set value is 0V ≤ set value ≤ 2.5V.
(2) Peltier is 0V for 15 min. from unit power is ON.
(3) Peltier voltage is not changed if door is open / close.

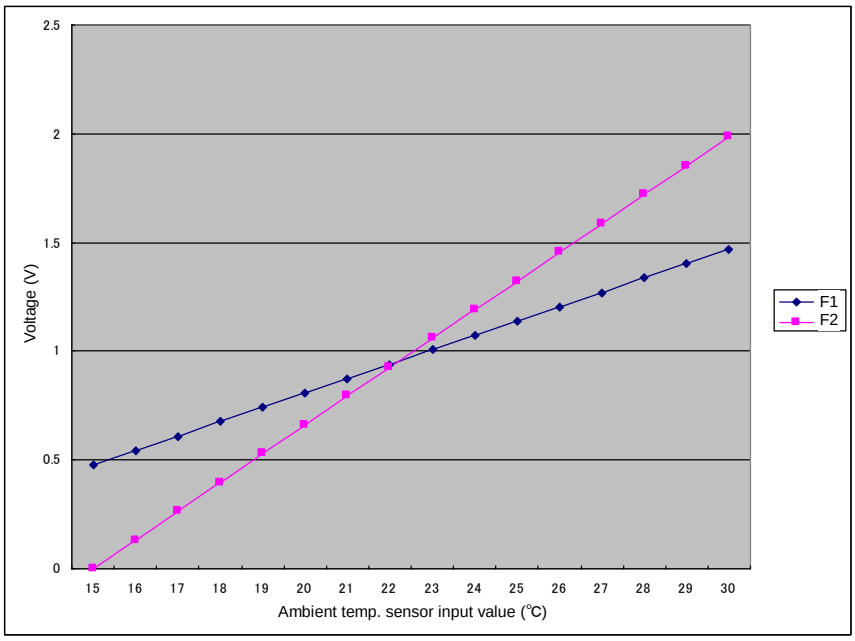
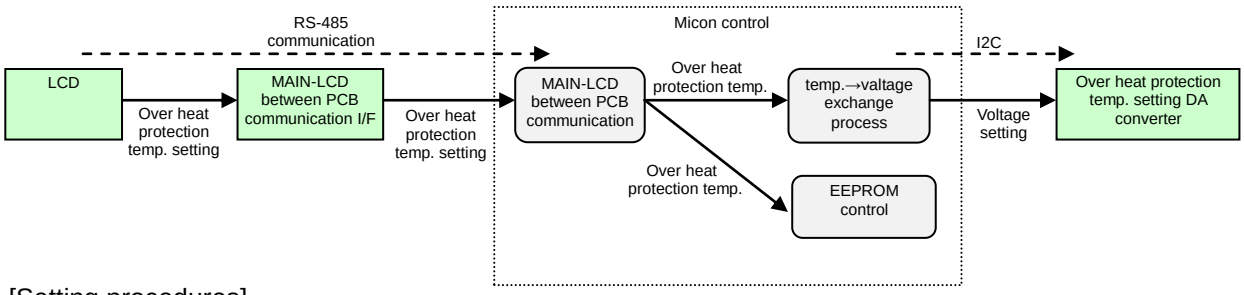
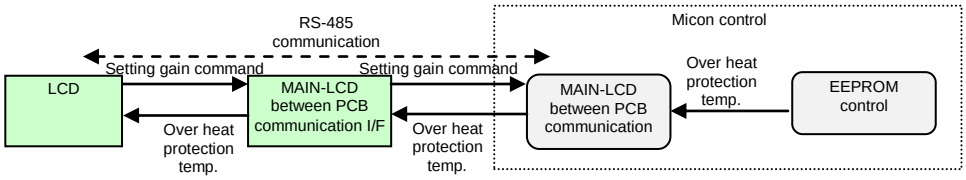


Fig. 12-1 Relation of ambient temp. sensor input value and voltage to peltier

13. Over heat protection setting



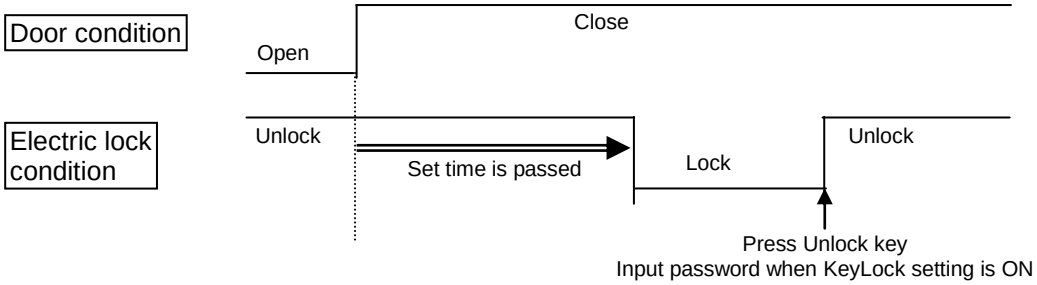
[Setting procedures]
(1) Set over heat protection temp. on LCD panel.
(2) Over heat protection temp. is sent to main PCB by communication between MAIN-LCD.
(3) Exchange over heat protection temp. to voltage on micon.
(4) Set voltage in (3) to over heat protection temp. setting DA converter.
(5) Store over heat protection temp. into EEPROM.



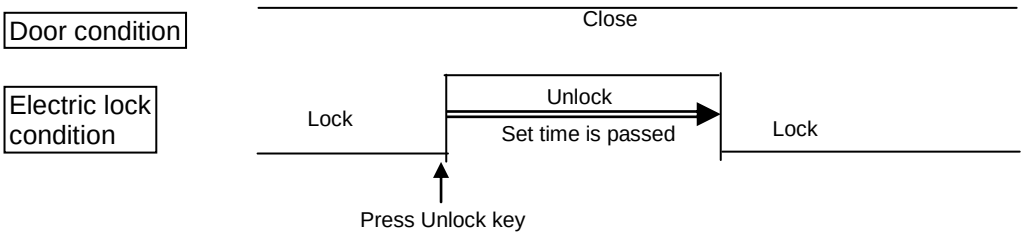
[Set value reading procedures]
(1) Over heat protection temp. setting value gain command is sent to main PCB by communication between MAIN-LCD.
(2) Read over heat protection temp. from EEPROM.
(3) Over heat protection temp. is sent to LCD by communication between MAIN-LCD.
(4) Display over heat protection temp. on LCD.

14. Auto lock function of electric lock

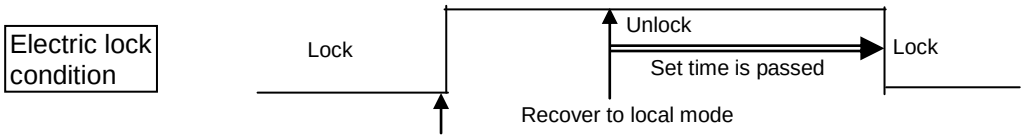
- Electric lock is ON after door is closed and set time is passed.
- Unlock by pressing “Unlock” key at Top display.
- Inputting password is necessary when pressing “Unlock” key if Key Lock setting is ON.
- Auto lock function is invalid during decontamination and remote mode.
- Setting range to electric lock is ON: 1 min.~60 min. (can be set by user), default: 1 min.



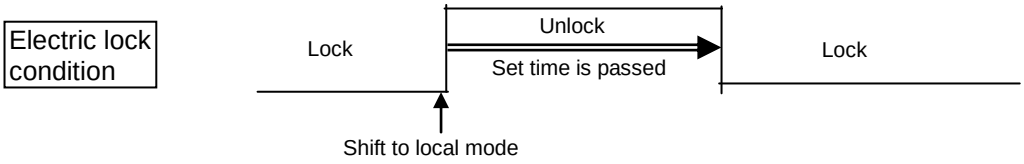
If Unlock key is pressed but door is not opened, it is locked again after set time is passed.



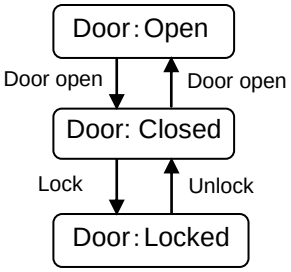
When the unit shifts to remote mode, electric lock is open condition and it is locked again after local mode recovery and set time is passed (only if auto lock function is valid).



If the unit is locked when shfting local mode, it is opened (Because it cannot be opened if auto lock function is invalid).

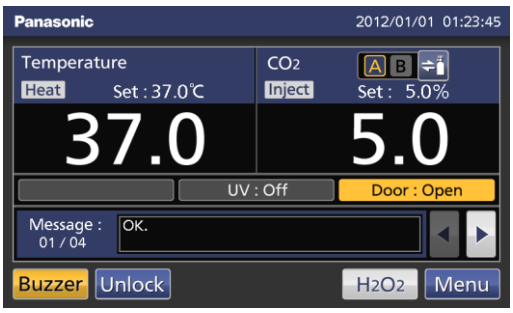


Door condition display shifts like following.

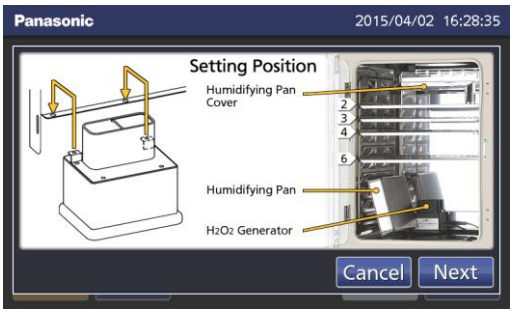


MCO-230AIC Operation (Decontamination)

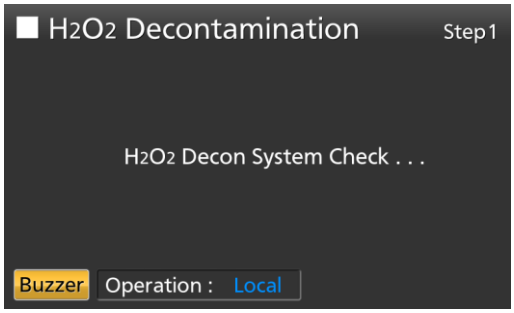
Decon Function must be set.



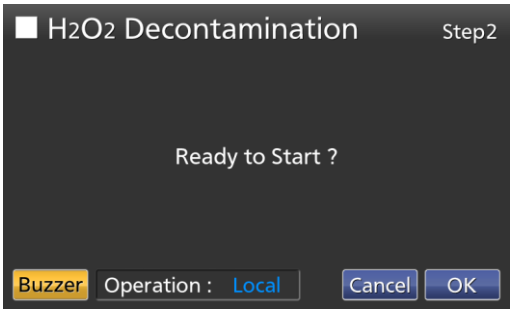
Press H_2O_2 key for 3 seconds.



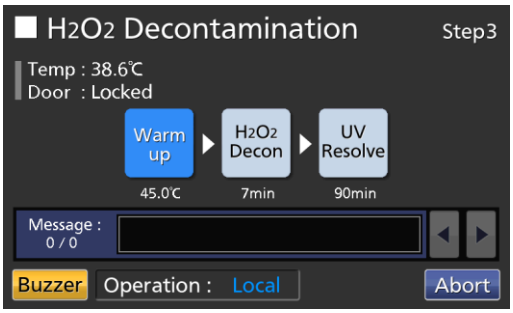
This is the process to displayed installation position of the interior parts.



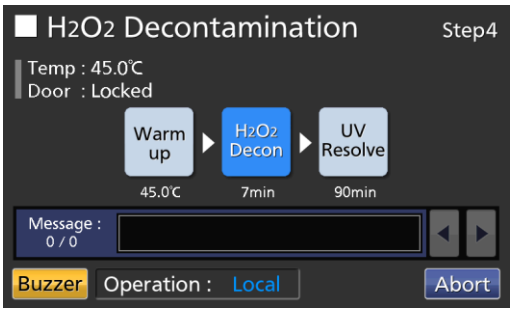
In automatically checks if the unit is in the condition to start decontamination.
(i.e. connecting condition of HP)



If the check result is normal, it becomes decontamination start display.
. (i.e. connecting condition of HP)

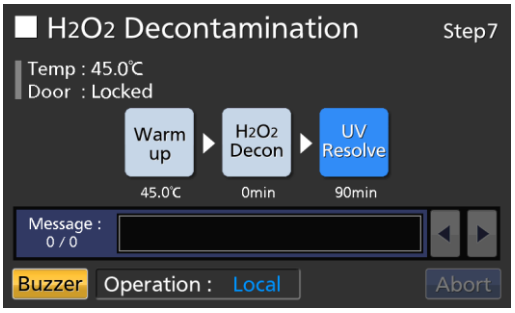


This is the process to warm up chamber to 45℃.
Remark: If you stop decontamination in the middle of process, press Abort key to move Step 8 (complete decontamination).



Step 4 is the process that generating H_2O_2 gas from H_2O_2 generator to do H_2O_2 decontaminate the chamber.
Remark: If you stop decontamination in the middle of process, press Abort key to move Step 7 (H_2O_2 gas decompose process by UV irradiation).

To be continued



Step 7 is the process of H_2O_2 gas decompose process by UV irradiation (Step 7 cannot be skipped).

During UV degradation, take on-off control between 47.5 and 48.2 ℃ to improve degradation efficiency.

Remark: There is no Step 5 and Step 6.

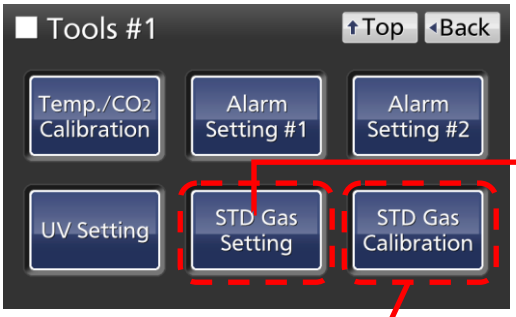
When H_2O_2 decontamination is completed, move to H_2O_2 decontamination display of Step 8.

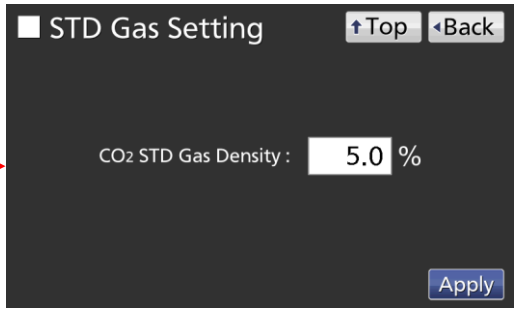
Open outer and inner door, then remove power connector of H_2O_2 generator from connector of body and pull out H_2O_2 generator.

Note: Must wear safety goggles and rubber gloves to work.

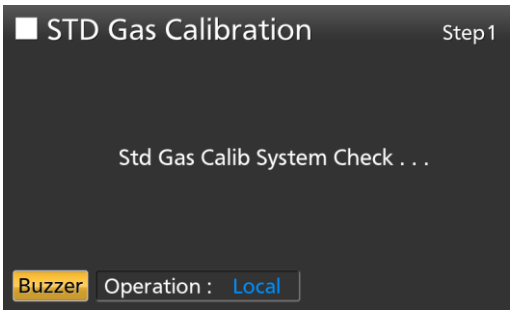
MCO-230AIC Operation (Standard gas calibration)

Std Gas Cal Function must be set.

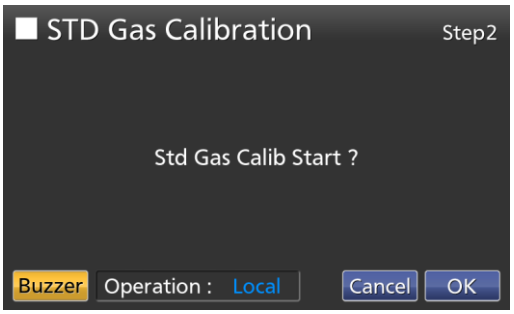




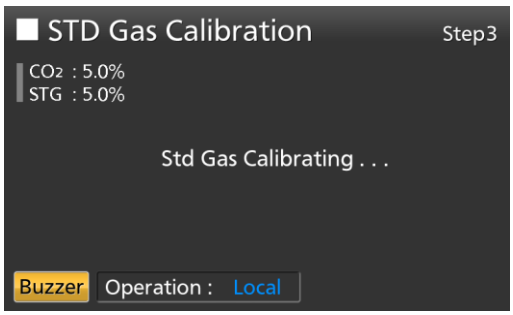
At STD Gas Setting display, input CO_2 density of connecting standard gas cylinder. Press Apply key to store input value and return to Tools#1 display.
Setting range: 4.0 %~21.0 %, Default: 5.0 %



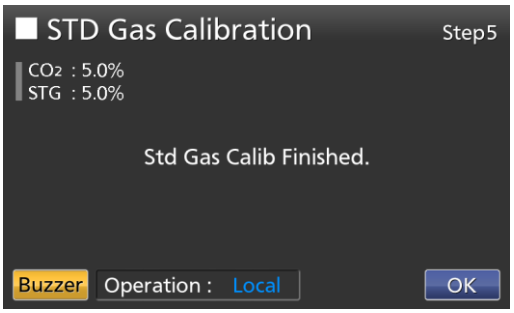
At STD Gas Calibration display Step 1, system check automatically starts. If system is normal, move to Step 2.



At STD Gas Calibration display Step2, press OK to move to Step 3.



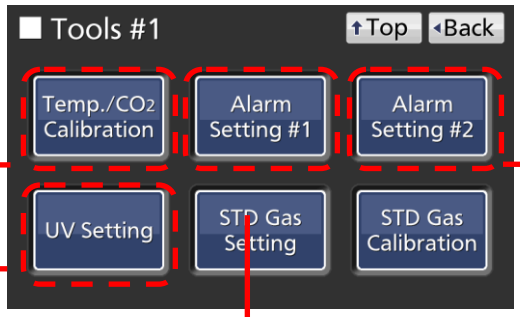
At STD Gas Calibration display Step 3, starts CO_2 density calibration. It moves to Step 5 automatically.

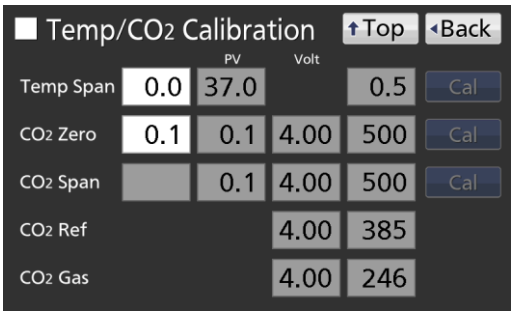


When CO_2 density calibration is completed, move to STD Gas Calibration display Step 5 and return to normal operation. Press OK key to return to Tools#1.
At Tools#1 display, press Top key to return to top display.

MCO-230AIC Operation （Tools #1）

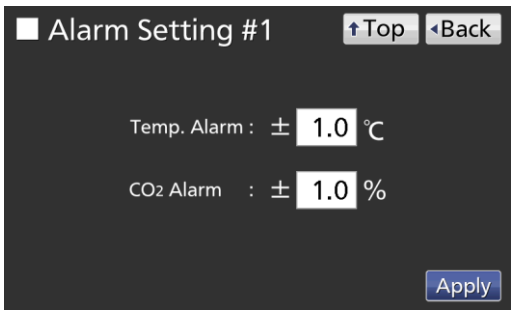
Input service code (384), so service key is active , if this is not case, key is blank.





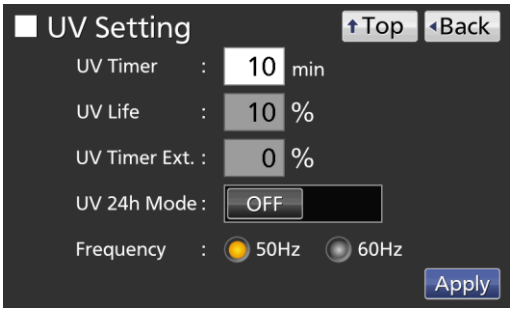
Temp. calibration, CO_2 zero adjustment and CO_2 span adjustment display.

Note) Setting range of temp. calibration is PV ±1℃.



- Temp. Alarm
Setting range: ±1.0℃~±5.0℃, Default: ±1.0℃

- CO_2 Alarm
Setting range: ±0.5%~±5.0%, Default: ±1.0%

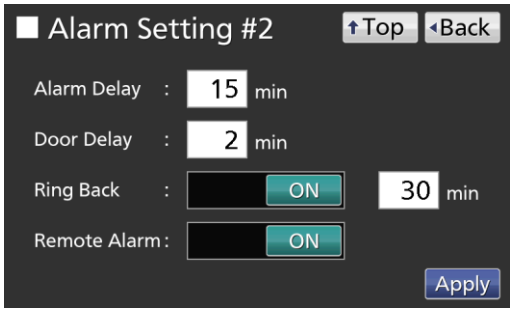


UV Timer
Setting range: 0 min.~30 min., Default: 10 min.

- UV Life
% display of current UV lamp accumulation time against recommended replace time 5000 hours (cannot be set).

- UV Timer Ext.
Extended ratio: 0%~40% (cannot be set), Default: 0%

- Frequency
Set frequency used for the unit. Select 50Hz or 60Hz by pressing radio button. Default: 50Hz



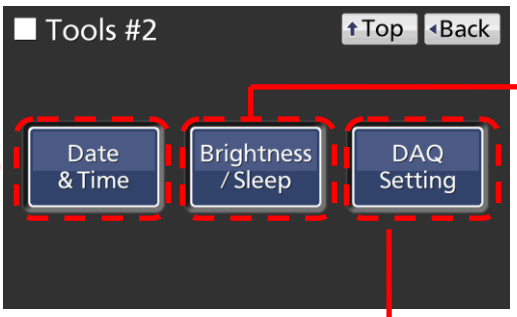
- Alarm Delay
Setting range: 0 min.~15 min., Default: 15 min.

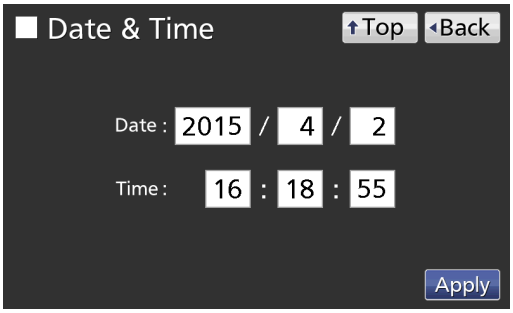
- Door Delay
Setting range: 1 min.~30 min., Default: 2 min.

- Ring Back
Setting range: 1 min.~99 min., Default: 30 min.

- Remote Alarm
Even if buzzer is stopped by pressing Buzzer key, not to cancel remote alarm (not inter locking with Buzzer key) and keep remote alarm active. Pressing remote alarm key and slide to right to become ON (not interlocking). Default: ON

MCO-230AIC Operation (Tools#2)



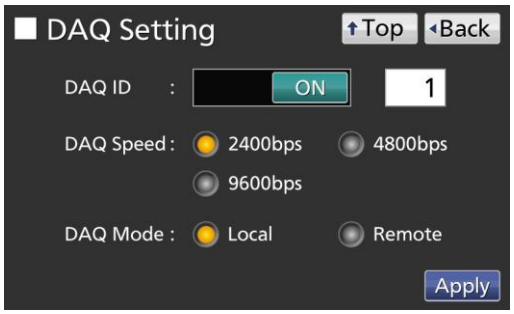


- Date

Set current date.

- Time

Set current time.

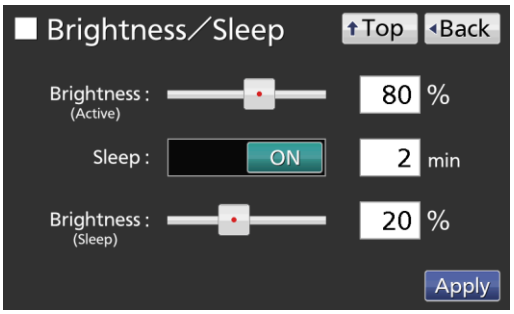


- Set DAQ ID

When connecting communication option, set DAQ ID.
Setting range: 1~250 (when communication is OFF: 0)
Default: 1

- Set DAQ speed

When connecting communication option, set DAQ speed.
(Default: 2400bps)



- Brightness (Active)

Brightness of display in normal condition. Adjusting by slide bar or input value
into box. Setting range: 50~100, Default: 80

- Sleep

If there is no operation for set time, decrease brightness of display to save electricity.
Pressing Sleep slide key and slide to right to become ON. Input time to become
sleep mode. Setting range: 1 min.~5 min., Default: 2 min.

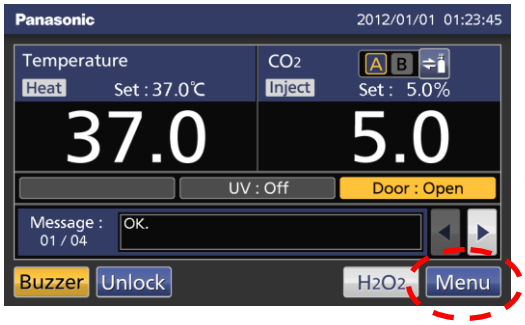
-Brightness (Sleep)

Brightness of display in sleep mode. Adjusting by slide bar or input value into box. Setting range: 0~50, Default: 20

Service Mode (not open to the user)

Set options

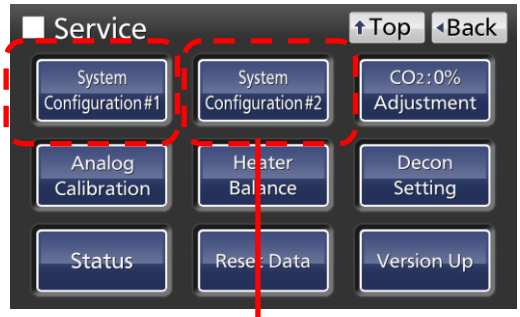
Note: When the unit is in sleep mode (the display is dark), it is not accepted any button operation. (just the display brightens) Therefore, please touch the display once and then start operation.

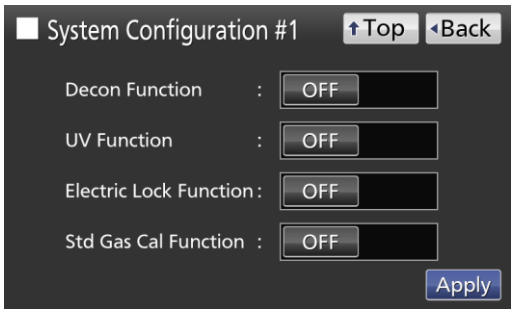


Press Menu key for 5 seconds.

Move to service code input display.
Input service code '384'.

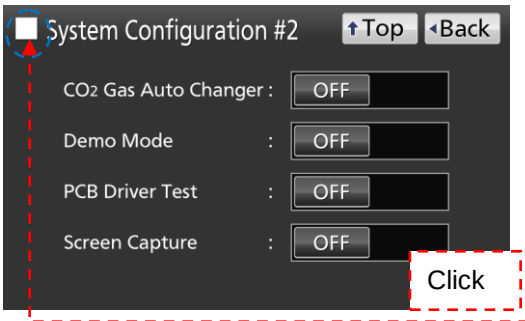
At Menu display, Service key becomes active, so press Service key to move to Service display.





System Configuration#1
Setting display of option installed.

- Decon Function : set decontamination option
- UV Function : set UV lamp option
- Electric Lock Function : set electric lock option
- Std Gas Cal Function : set standard gas option

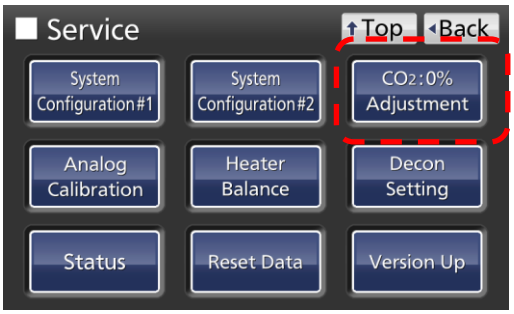


System Configuration#2
Setting display of option installed.

- CO_2 Gas Auto Changer: set gas changer option
- Demo Mode: set demo mode
- PCB Driver Test: used for PCB inspection
- Screen Capture: click the box at upper left to store displayed screen to USB memory.

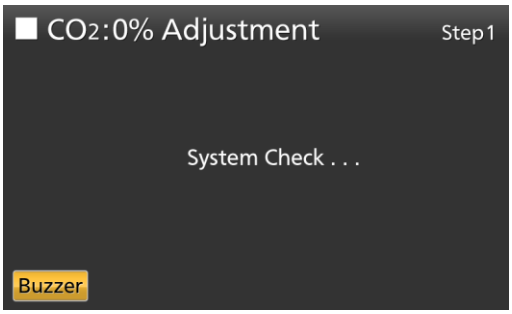
Service Mode (not open to the user)

CO_2:0% Adjustment (auto calibration)

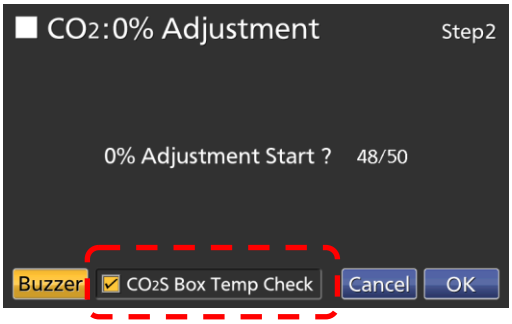


1. Make chamber temp. and CO_2 sensor box temp. (45℃±2℃) stable with CO_2 set value 0.0%.
2. Make sure there is no CO_2 gas in chamber.

*** If you carry out re-adjustment, open the door and make**



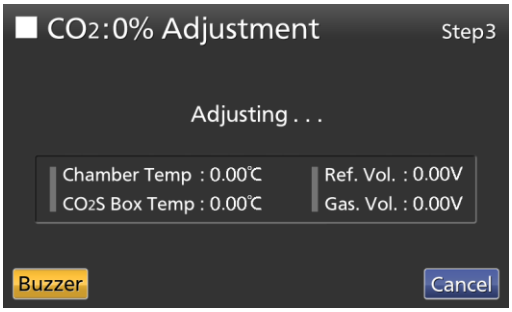
Start 4V adjustment system check.



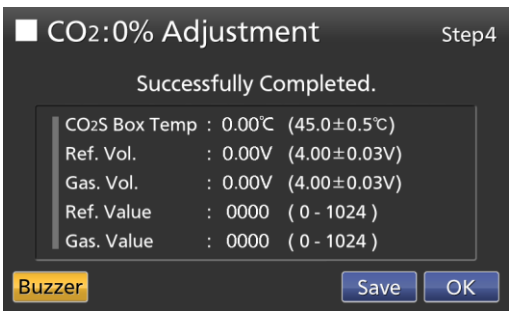
Check in box: Wait for CO_2 sensor box temp. become stable and start 0% adjustment.

※Temp. stable: Confirm the temp. is in the range of 45 ℃ ±1 ℃ for 90 minutes consecutively

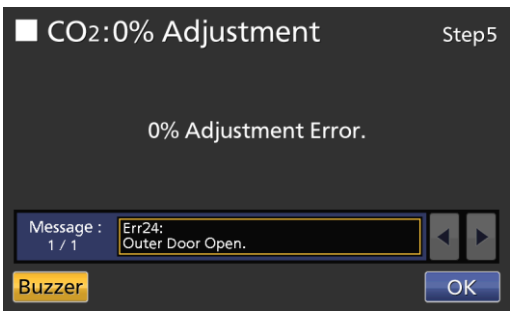
※ 0 adjustable number (i.e. 48/50) is displayed. (Max 0 adjustable number is 50.)



Make voltage to 4V by adjusting electric volume automatically.



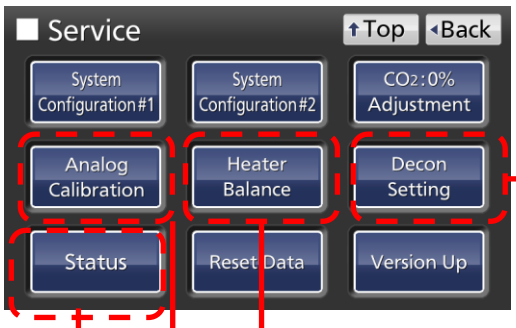
If the adjustment is completed correctly, above screen is displayed. Press Save key to store the result. Press OK key to return Top display.

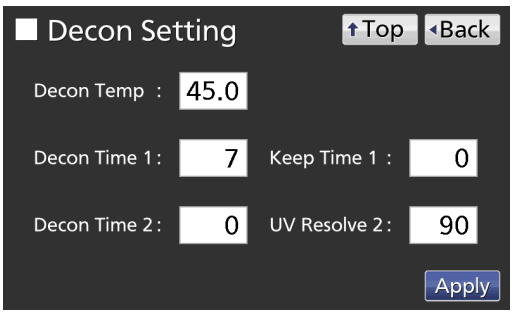


If there is any error, above screen is displayed. Error description is in message box.

Service Mode (not open to the user)

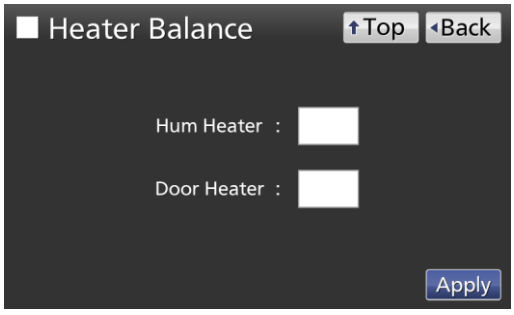
Analog Calibration／Heater Balance／Decon Setting／Status





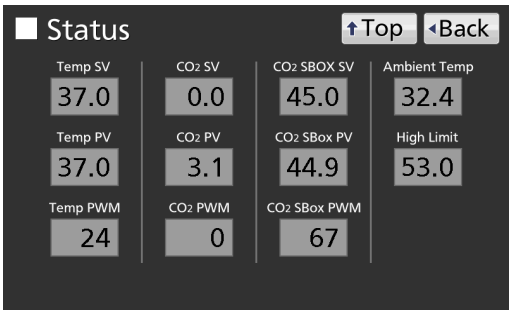
Decontamination setting (Default)

Decon Temp:	45℃		
Decon Time1:	7 min.	Keep Time1	0 min.
Decon Time2	0 min.	UV Resolve2	90 min.



If there is condensation in chamber, adjust heater balance.
Hum Heater: Bottom heater
Door Heater: Door heater

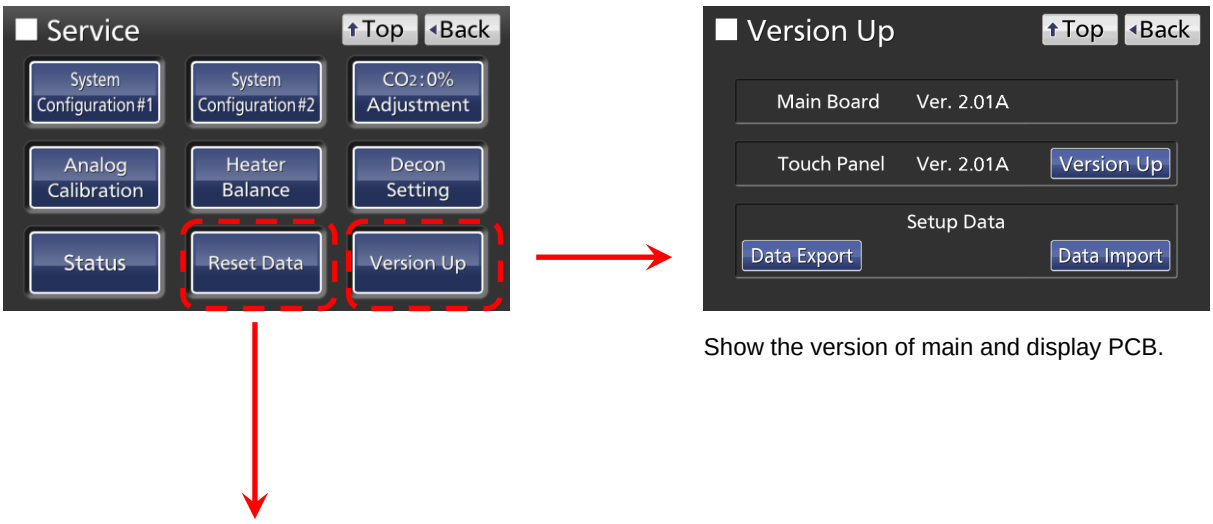
Adjust analog output voltage in here if necessary.



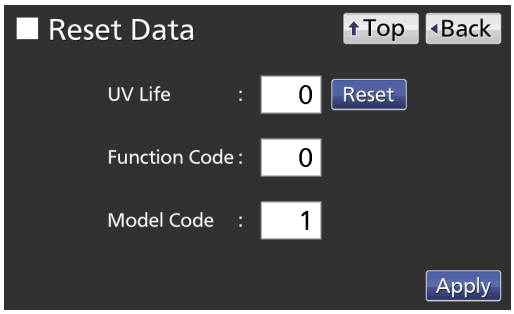
Showing running status of unit.
Temp. SV/PV
CO_2 density SV/PV
CO_2 sensor box temp. SV/PV

Service Mode (not open to the user)

Reset Data／Version Up



Show the version of main and display PCB.



Model Code:

Model Code	Product
0	MCO-170AIC
1(initial value)	MCO-230AIC

UV Life: Reset UV lamp accumulation time.

Function Code:

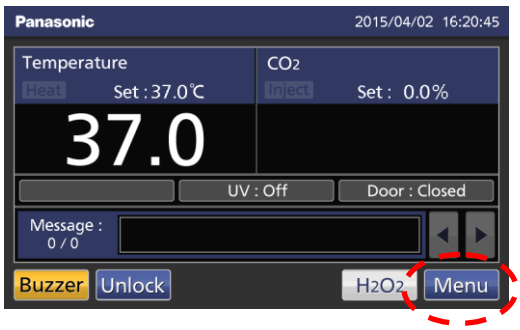
Function Code	Function
019	Initialize CO_2 zero point / span point
925	Initialize EEPROM memory Note) Initialize temp. calibration value as well, so adjustment from temp. calibration is necessary.

※ * If you do not want to reset UV lamp accumulation time, input current UV lamp

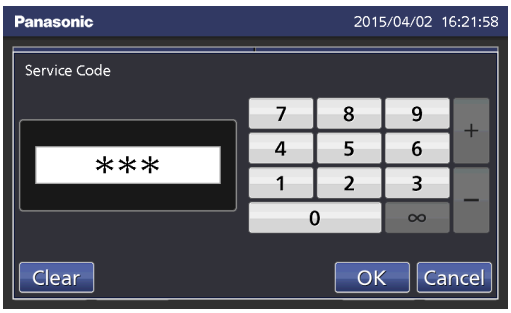
※ accumulation time into UV life box when inputting function code.

Service Mode (not open to the user)

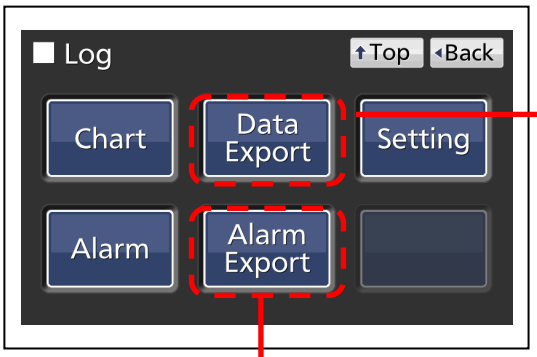
Erasing log data／alarm recording



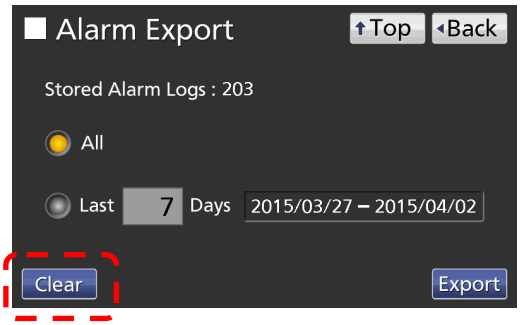
Press MENU key for 5 seconds.



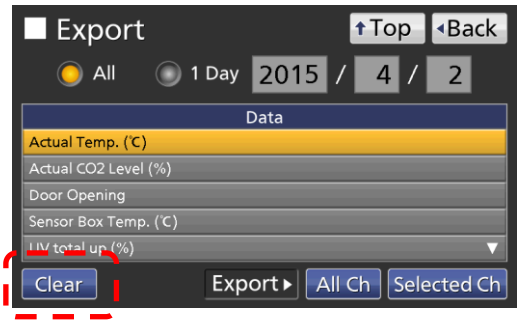
Move to Service Code display so input “384”



※ **It is necessary for log data erasing to input service code.**



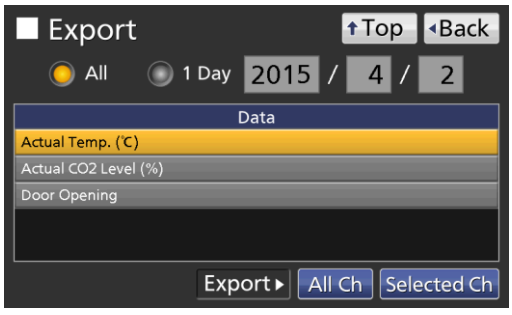
Input service code and press Alarm Export key, so Clear key is displayed at bottom left of display. Then press this key, so can delate alarm record



Input service code and press Data Export key, so Clear key is displayed Clear key. Then press this key, so can delate logging data.

【Reference】

Press Alarm Export key without input service code, Clear key is not displayed at bottom left of display.



Press Data Export key without input service code. Clear key is not displayed at bottom left of display.

Specifications of sensor

■ Temperatures and resistances of temperature sensor (Type:103AT-1)

Temperature (℃)	Resistance value (kΩ)	Temperature (℃)	Resistance value (kΩ)	Temperature (℃)	Resistance value(kΩ)
0	27.28	17	13.57	34	7.19
1	26.13	18	13.06	35	6.94
2	25.03	19	12.56	36	6.70
3	23.99	20	12.09	37	6.47
4	22.99	21	11.63	38	6.25
5	22.05	22	11.20	39	6.03
6	21.15	23	10.78	40	5.83
7	20.29	24	10.38	41	5.63
8	19.48	25	10.00	42	5.44
9	18.70	26	9.63	43	5.26
10	17.96	27	9.28	44	5.08
11	17.24	28	8.94	45	4.91
12	16.55	29	8.62	46	4.75
13	15.90	30	8.31	47	4.59
14	15.28	31	8.02	48	4.44
15	14.68	32	7.73	49	4.30
16	14.12	33	7.46	50	4.16

■ CO_2 density and output voltage of CO_2 sensor (Type: IR sensor)

* Values are the reference only.

CO_2 density (%)	Output voltage (V)	CO_2 density (%)	Output voltage (V)	CO_2 density (%)	Output voltage (V)
0.0	4.00	8.0	2.90	16.0	2.49
1.0	3.66	9.0	2.84	17.0	2.46
2.0	3.47	10.0	2.78	18.0	2.42
3.0	3.33	11.0	2.72	19.0	2.38
4.0	3.22	12.0	2.67	20.0	2.34
5.0	3.12	13.0	2.63		
6.0	3.04	14.0	2.58		
7.0	2.97	15.0	2.54		

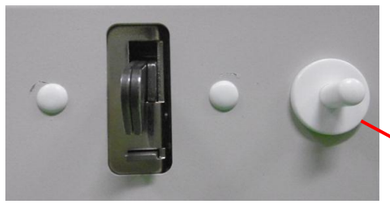
* R40 on Main PCB

Parts Layout

＜Inside chamber＞

Humidifying pan

＜Electric Lock＞



＜Behind partition＞

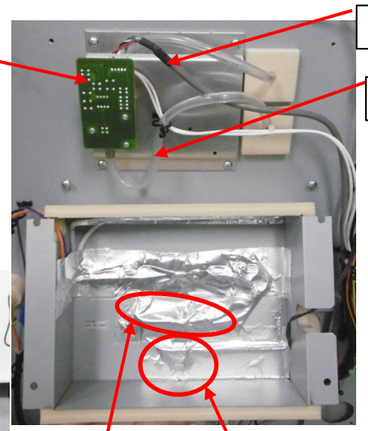
Fan motor

UV lamp

Humidity adjusting bar

＜Inside CO2 sensor box＞

CO2 sensor



CO2 heater B

CO2 heater A

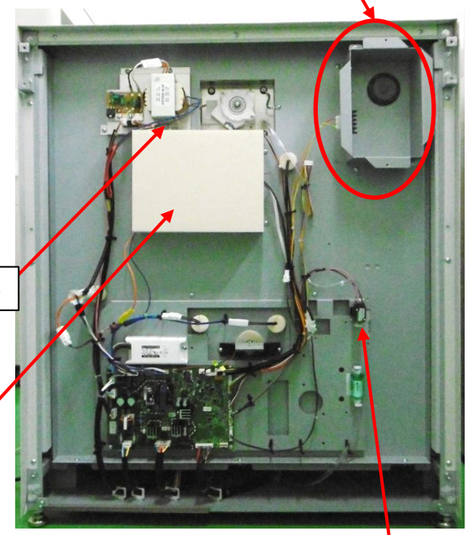
Temp. fuse

Thermistor

Remote alarm terminal

Access port

＜Back side＞



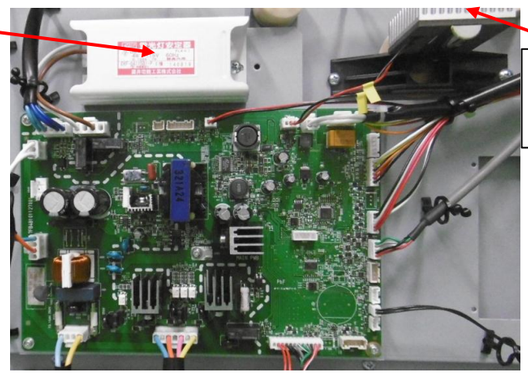
H2O2 PCB

CO2 sensor box

CO2 valve

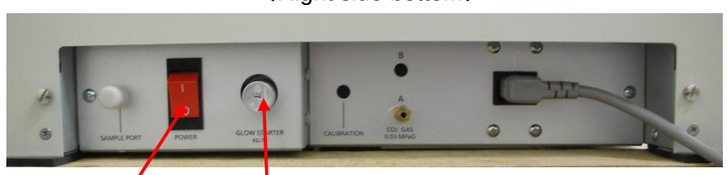
＜Main PCB＞

Ballast



Humidity adjusting bar

＜Right side bottom＞



Breaker switch

Glow starter

Door reversible procedures

1. Unplug and make sure that the electricity to the product is not supplied

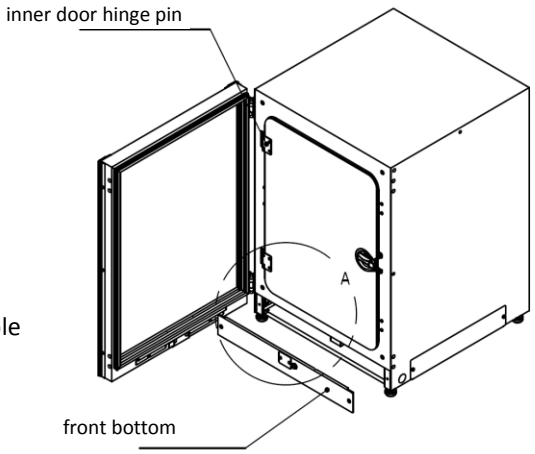
2. Remove inner door and door.
   (1) Remove front bottom panel (screw 2)

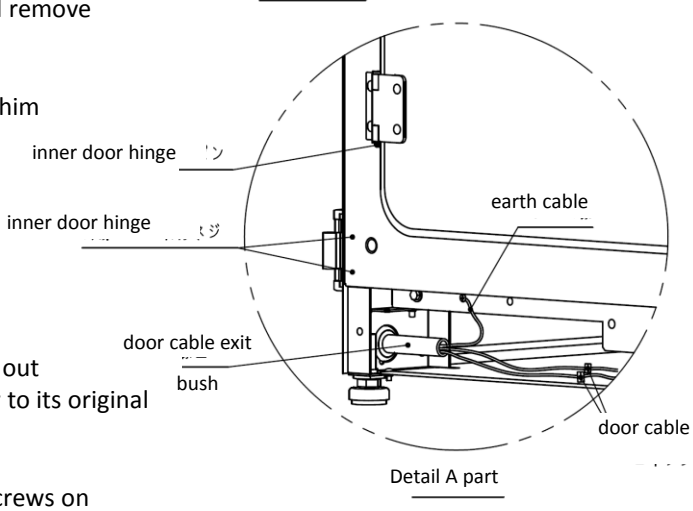
   (2) Pull upward the inner door hinge pin and remove inner door.

   (3) Remove two door cable connectors, earth cable and bush and , then pull out door cable to the outside.

   (4) Remove 4 screws of door hinge and remove door

Note : Be carful not to lose door hinge shim

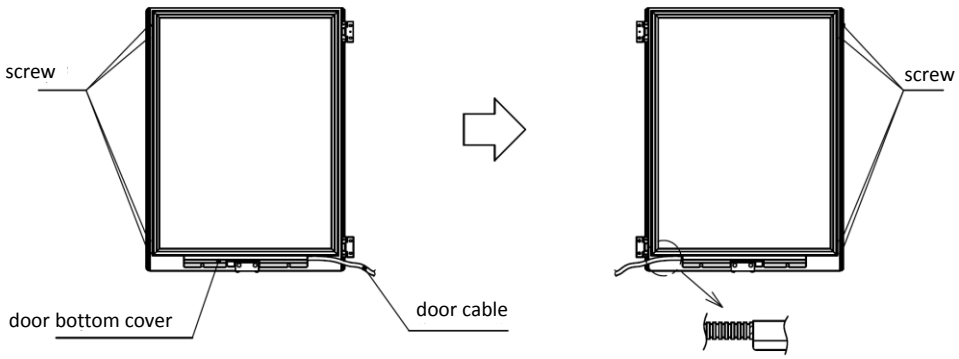




3 Preliminary work for door reversible

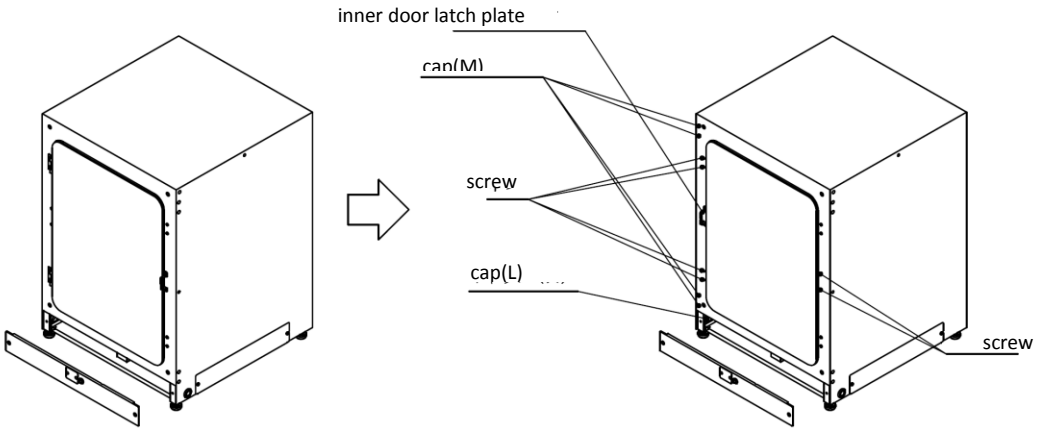
(1) Remove door bottom cover and pull out cable to other side and then fix cover to its original position

(2) Make a left and right of hinges and screws on door body to reverse. In this case, to replace the orientation of the door hinge shaft upside down



4 Preliminary work for body side reversible

(1) Reverse left-right some parts on body ; screw cap (M), door cable exit cap (L), inner door hinges , inner door latch plate mtg. and screw.

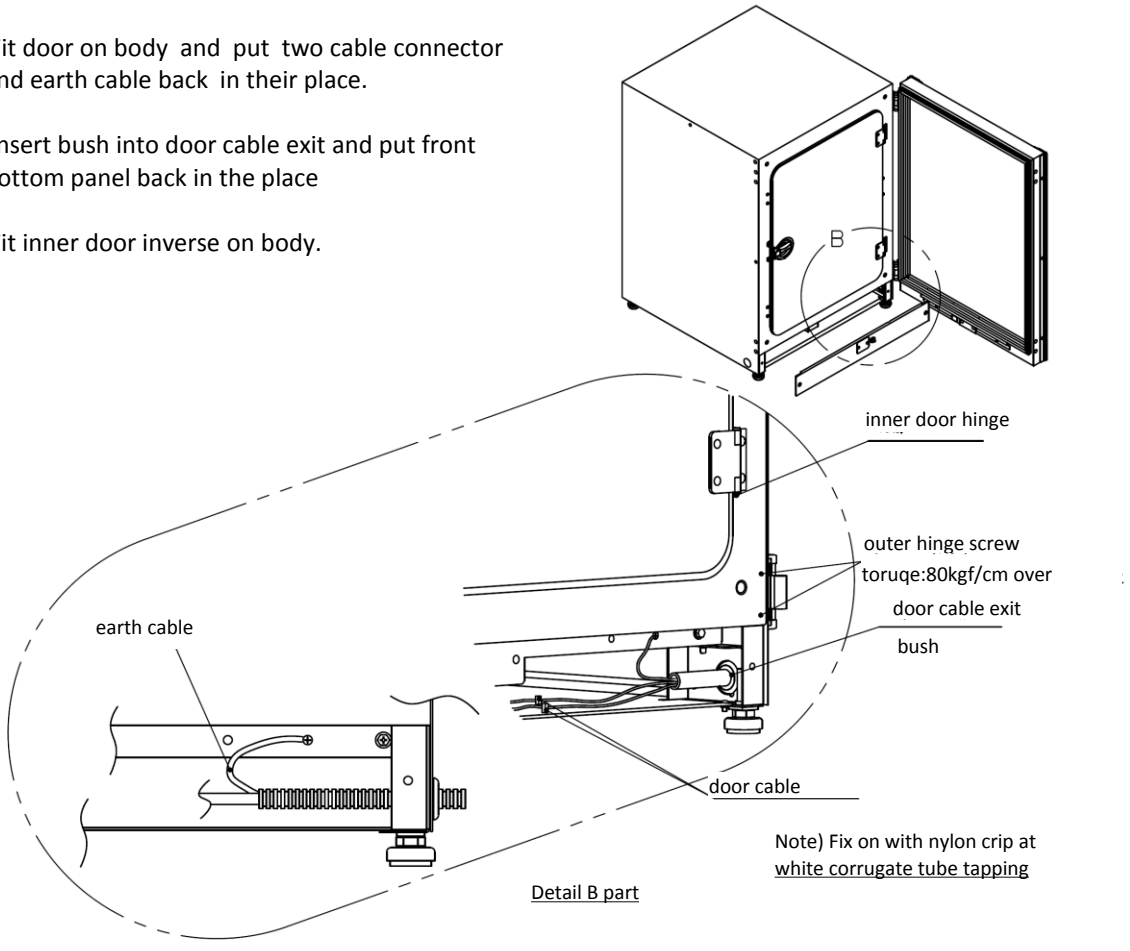


5 Fit on inner door and door

(1) Fit door on body and put two cable connector and earth cable back in their place.

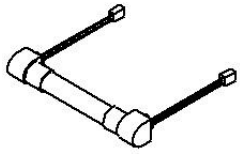
(2) Insert bush into door cable exit and put front bottom panel back in the place

(3) Fit inner door inverse on body.

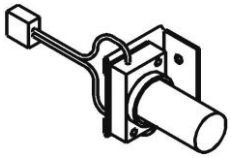


MCO-170UVS installation manual

Accessories



① UV lamp 1pc

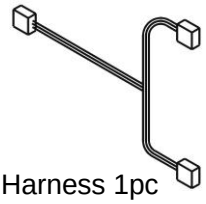


④ Glow assy 1pc

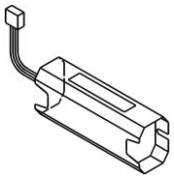
⑥ UV caution label D 1pc

⑦ UV caution label B 1pc

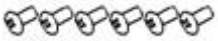
⑧ Name plate 1pc



② Harness 1pc



⑤ Ballast 1pc



③ Screw (M4) 6pcs (2pcs spare)

Installation procedures

1. Remove power supply code and make sure unit is not power supplied.

2. Take all duct out inside chamber and remove caps (2pcs) in figure 1.

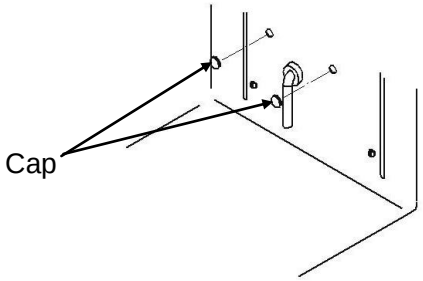


Figure 1

3. Remove rear cover in figure 2.

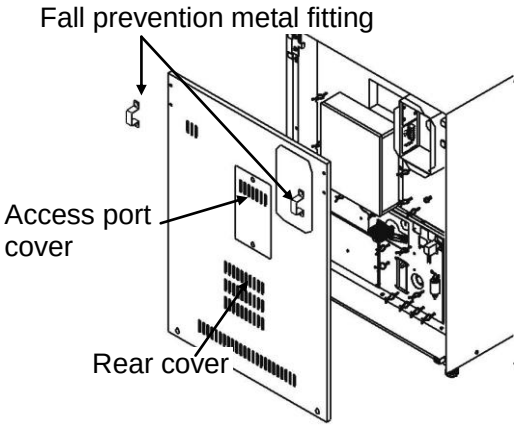


Figure 2

4. Take out insulation (2pcs) in figure 3. It is easier to take out by pushing from inside chamber. Removed insulation will be reused, so please keep them.

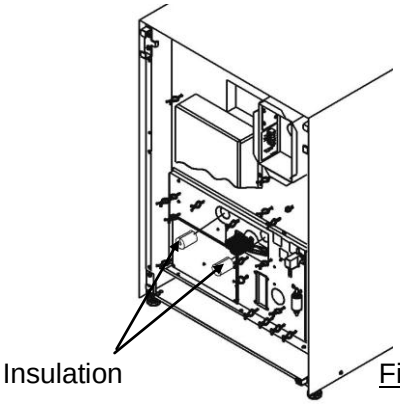


Figure 3

5. Put ①UV lamp into the hole that cap removed.

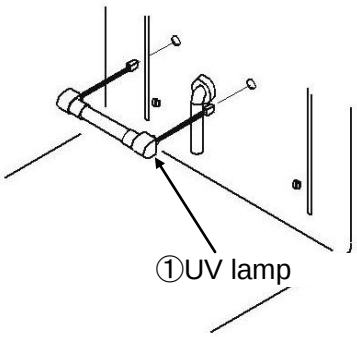


Figure 4

6. Install duct as it was.
Put humidifying pan and set cover.

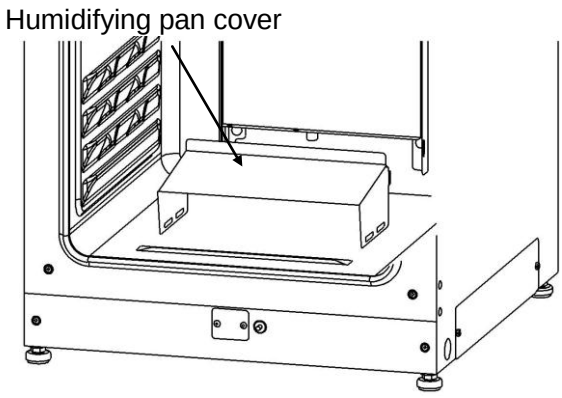


Figure 5

7. Remove lower side cover and power mounting plate inside.

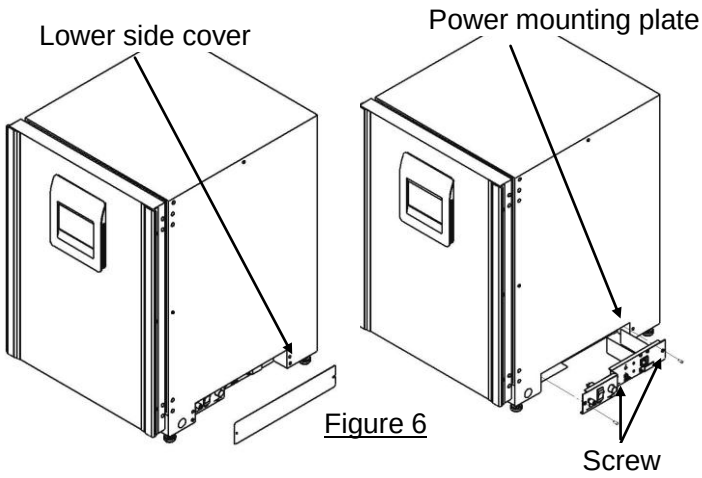


Figure 6

8. Remove cap of power mounting plate that removed in section 7 and install glow assy.

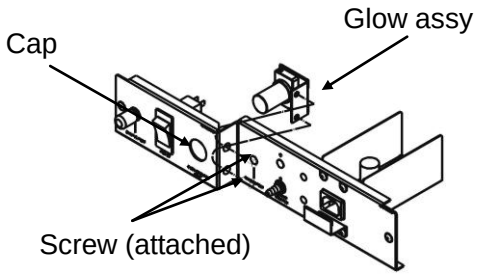
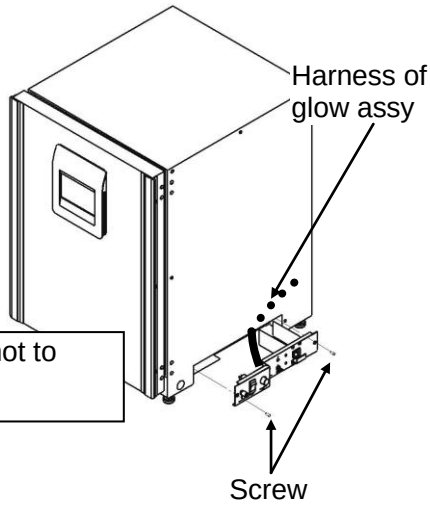


Figure 7

9. Let harness through under unit to back side and install power mounting plate as it was.



Note) Make sure not to catch wires.

Figure 8

10. Put UV lamp lead wire into a cut of insulation removed in section 4. Then install the insulation.

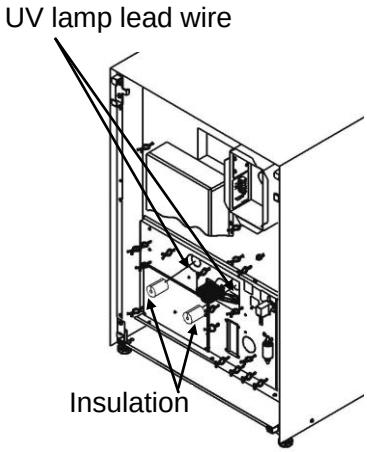


Figure 9

11. Connect ②Harness to connector of UV and fix ⑤Ballast using attached screws.

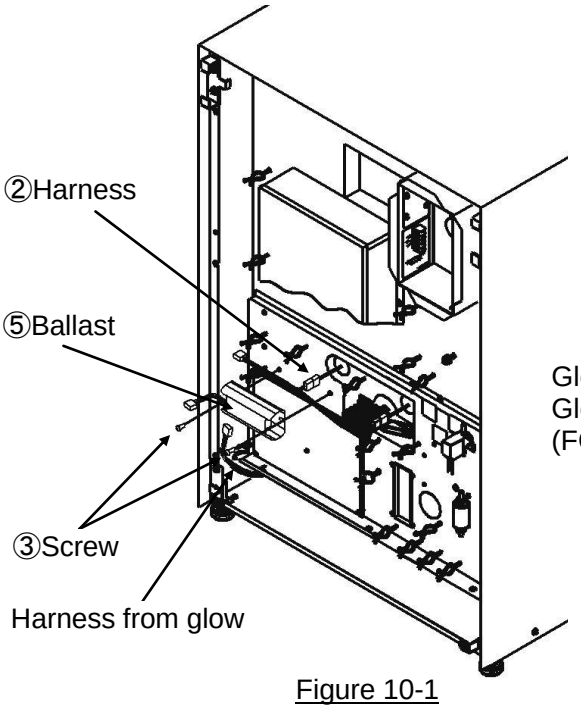


Figure 10-1

12. Connect each lead wire connector of ballast and glow assy based on circuit diagram in figure 10-2.

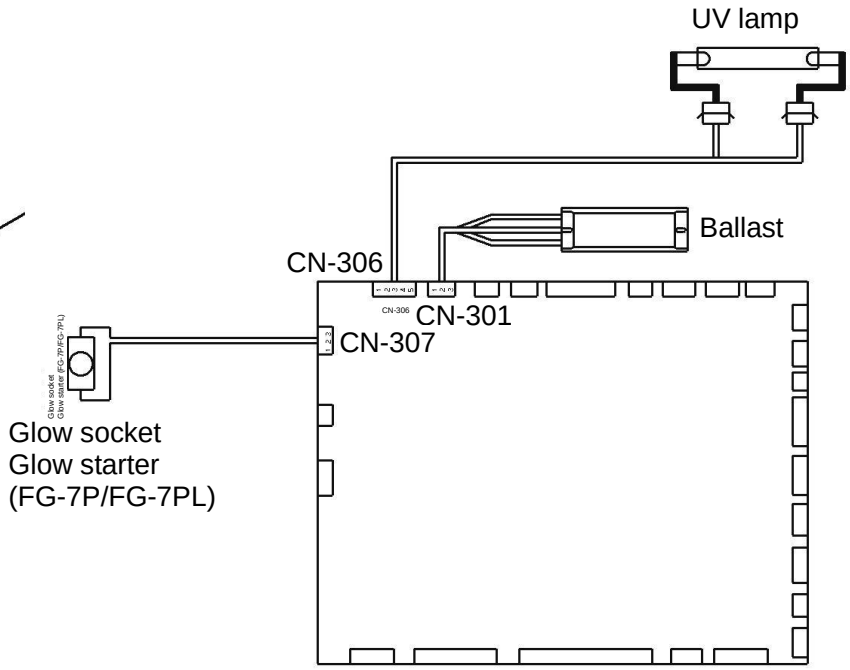


Figure 10-2

13. Stick labels

* As for ⑧Name plate, use required name plate for each model.

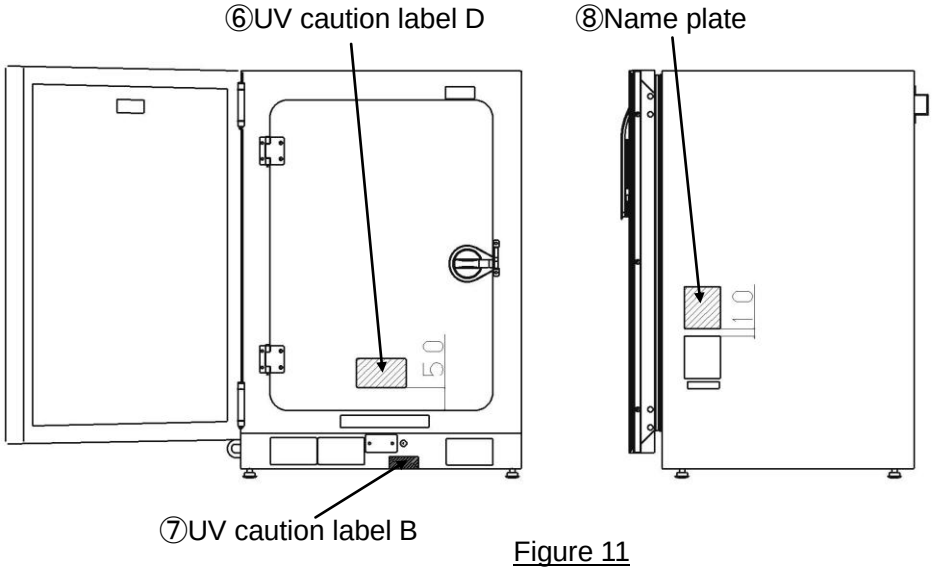
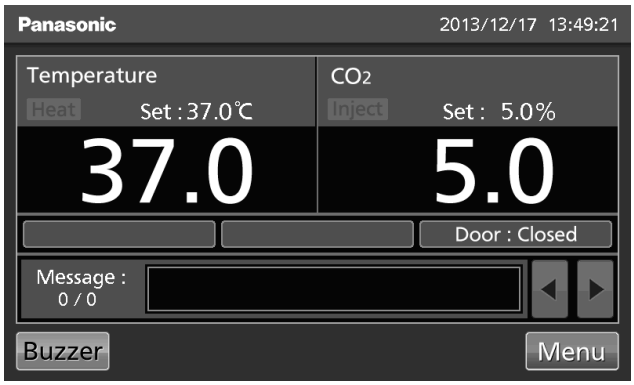


Figure 11

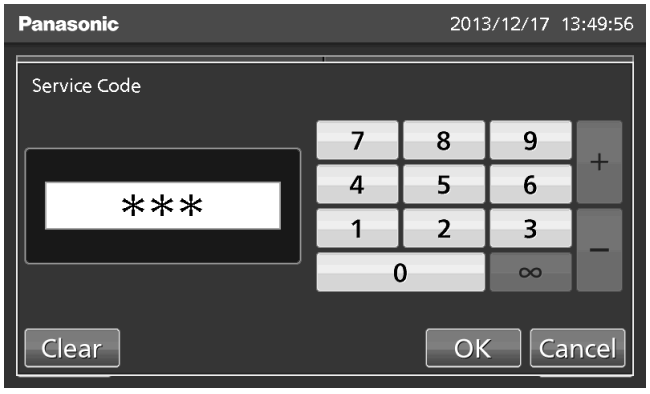
14. UV setting on control panel

After installing UV lamp, please follow below setting on control panel.

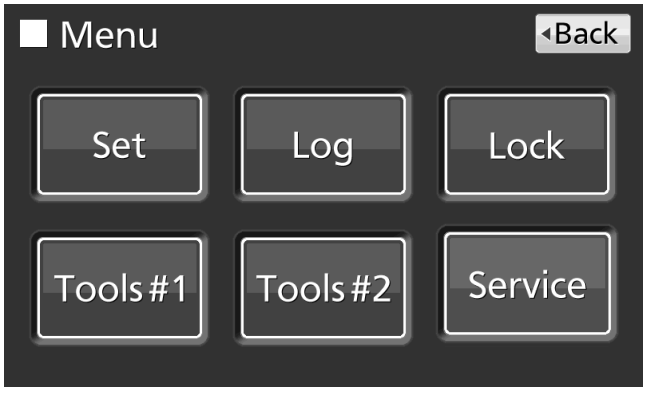
1. Press Menu key more than 5 sec. at top display to move to Service code display.



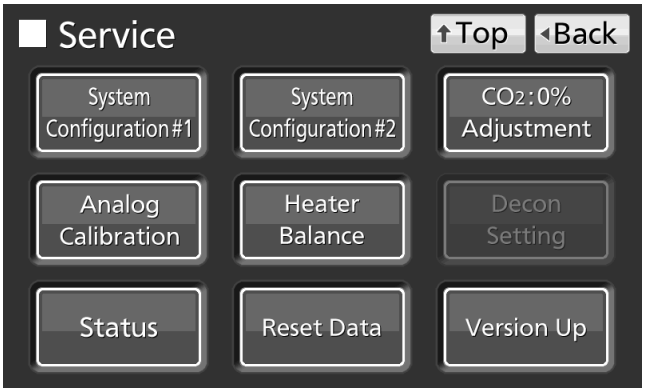
2. Input “384” at Service code display and press OK key.
(Note) If incorrect service code is input, “Notice” is displayed and return to 1. top display.
Input correct service code again.
(service code cannot be changed)



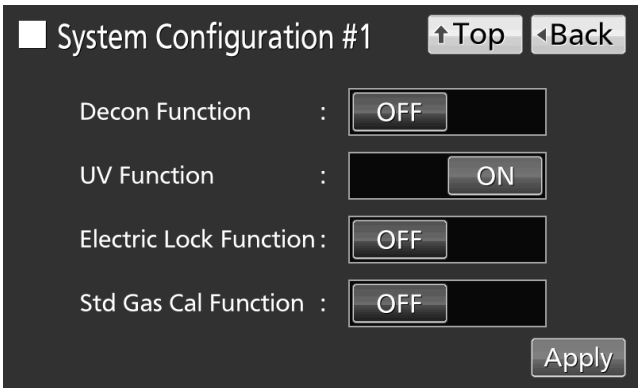
3. Move to Menu display and Service key can be pressed.
Press Service key.



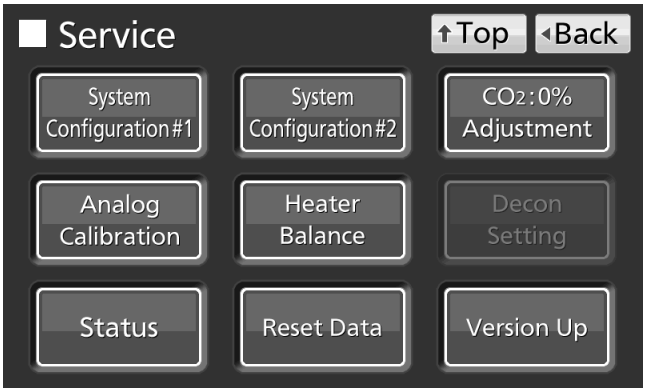
4. At Service display, press System Configuration#1 key.



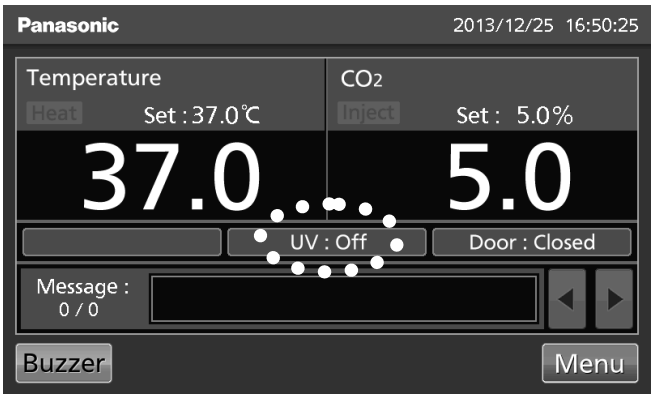
5. At System Configuration#1 display, slide UV Function key to right side and make it ON and press Apply key.



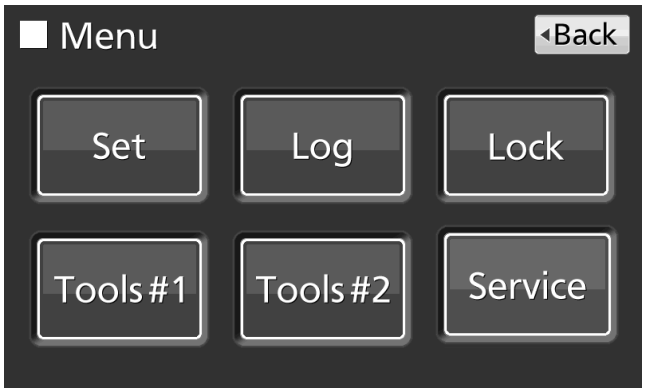
6. Press Top key at Service display to return to Top display.



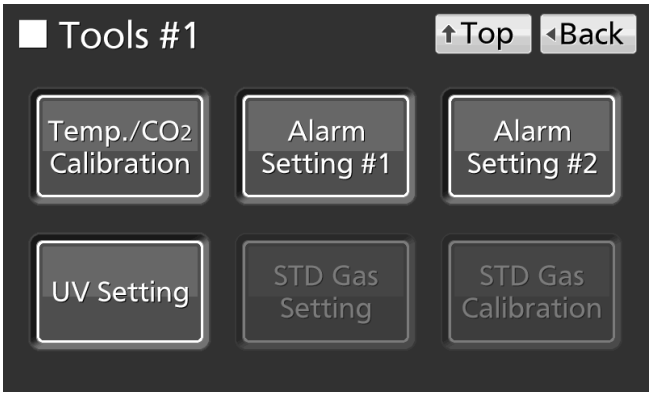
7. Press Menu key at Top display to move to Menu display.
Confirm 'UV' is displayed at center.



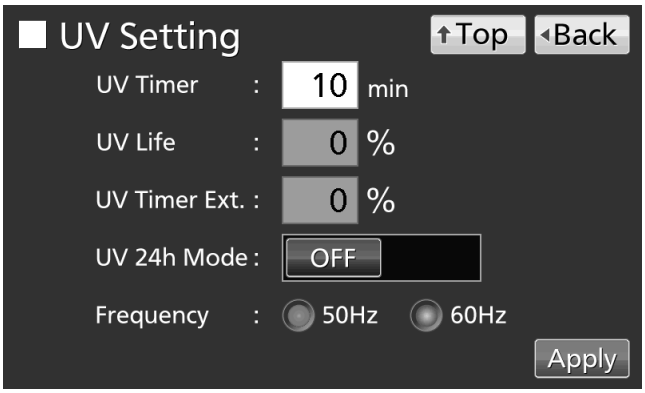
8. Press Tools #1 keyt at Menu display to move to Tools #1 display.



9. Press UV Setting key at Tools #1 display to move to UV Setting display.

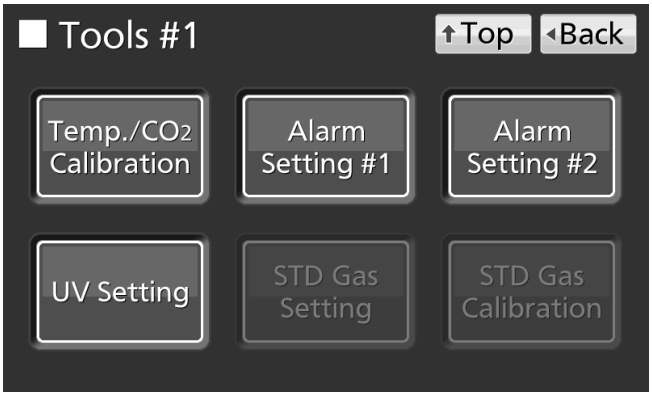


10. Confirm Frequency setting (50Hz/60Hz) at UV Setting display.
Change frequency by selecting radio button and press Apply key if necessary.
Move to Tools #1 display.
(Lighted one is current setting)
If not need to change, press Top key to return Top display.



Refer to instruction manual about UV lamp lighting time setting, etc.

11. Press Top key at Tools #1 display to return Top display.



12. Confirm UV lamp lighting

Confirm UV lamp lighting by following below procedures.

	Procedures
1	Press door switch with outer door opened and inner glass door closed.
2	Confirm UV indicator on control panel is lighted after few seconds.
3	Confirm blue visible light from front side of humidifying pan cover. (Confirm the light through inner door glass, do not see UV light directly)

MCO-170HB Installation manual

■ Parts

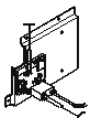
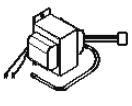


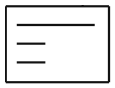
Plate meeting



Transformer

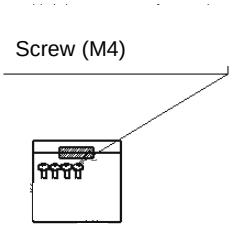
Insulation

Water proof connector



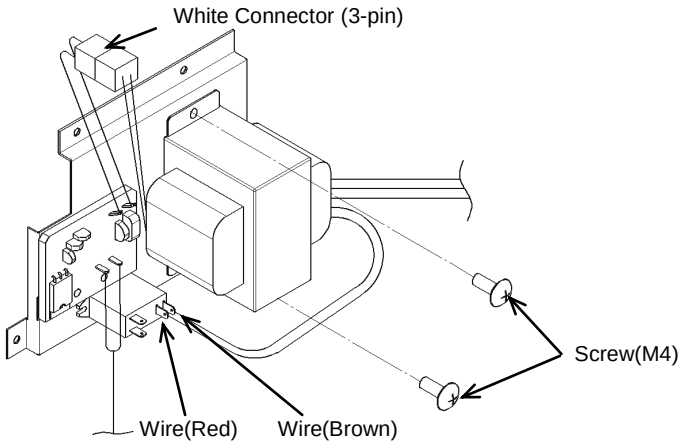
Name plate

■Tools

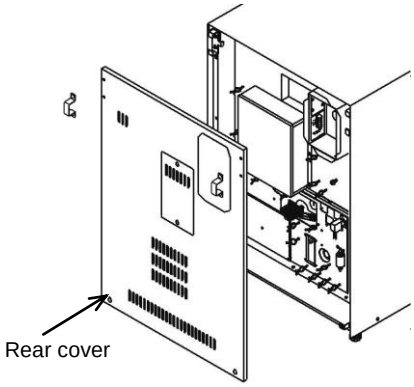


- Philips Screwdriver
- Wrench (8mm)

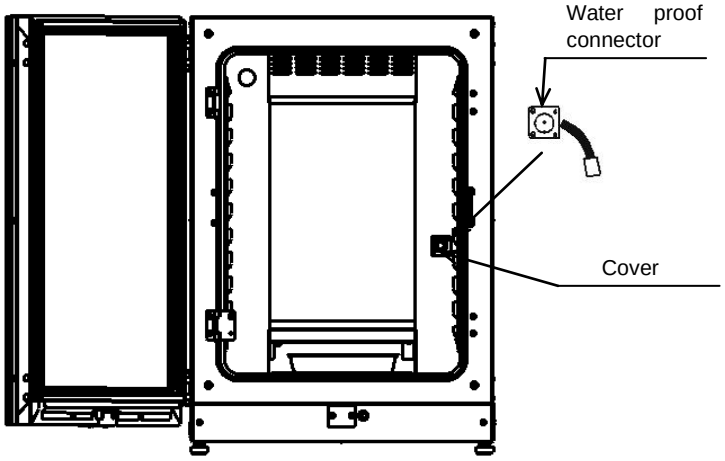
※ It does not work with this product itself.



① Mount transformer on plate meeting and secure with screws (M4) and connect each wires (red and brown) to the places as left picture specified.

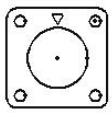


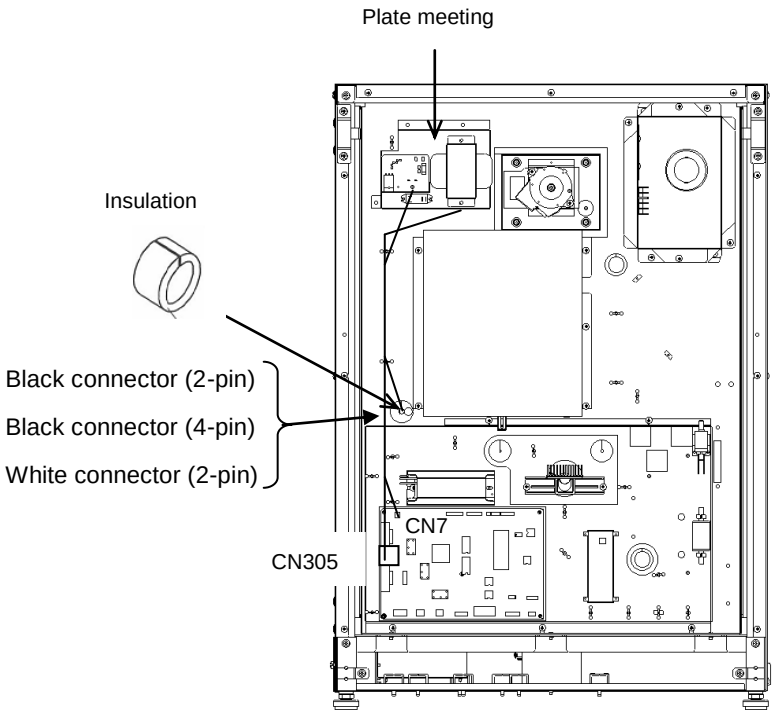
② Remove rear cover.



③ Remove rear cover of inner cabinet, 2pcs of cover under frame and cover inside door. Fit water proof connector to the place as left picture specified.

Note) Mark triangle should be oriented to upper position.





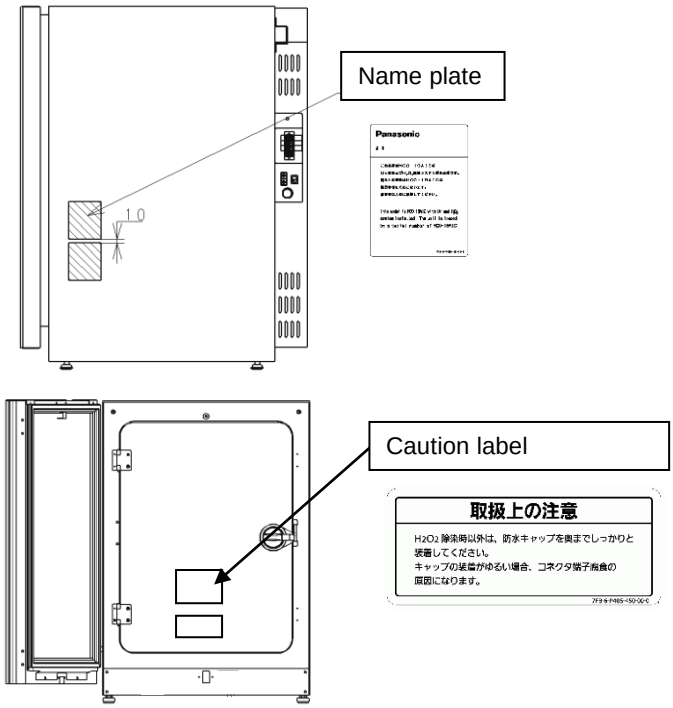
④ Fit plate meeting to the places as left picture specified and connect each connectors.

Harness of Transformer → CN305
Harness of Plate meeting → CN7

Note)Insert the insulation.

<Layout for Name plate and Caution label>

Put Name plate and Caution label on the following specified places.



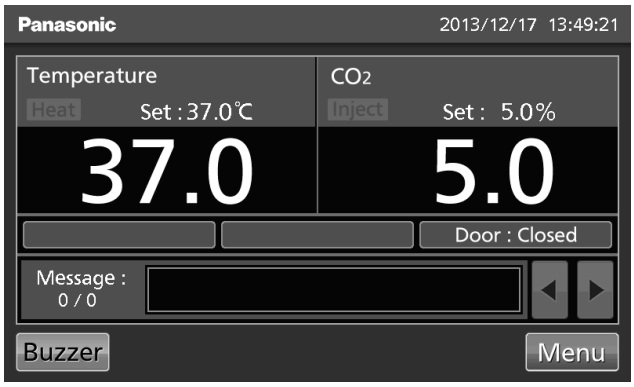
MCO-170HB Initial setting procedures

・ Setting of the decontamination option using the control panel

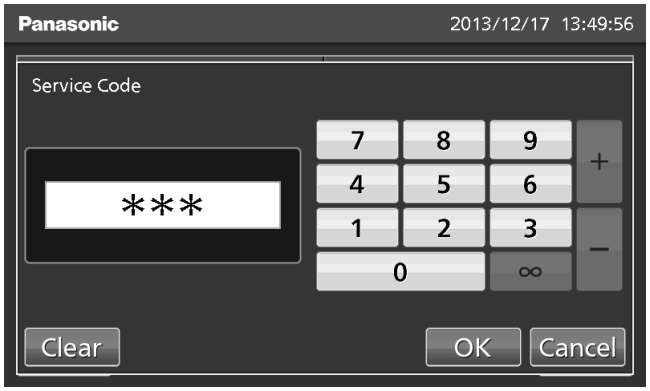
The H_2O_2 decon board “MCO-170HB” can’t work alone.
Check the following optional kit is installed.
・The electric lock kit “MCO-170EL” is installed on the MCO-230AIC.
・The UV lamp add-on kit “MCO-170UVS” and the electric lock kit “MCO-170EL” is installed on the MCO-230AIC.

After decontamination kit “MCO-170HB” is installed, use the following procedure to enable the decontamination option.

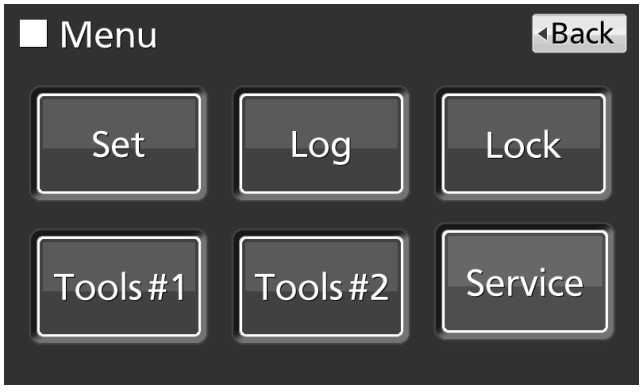
1. By pressing the munu key (Menu) 5 seconds or more of the “Top” screen, the “Service code” screen is displayed.



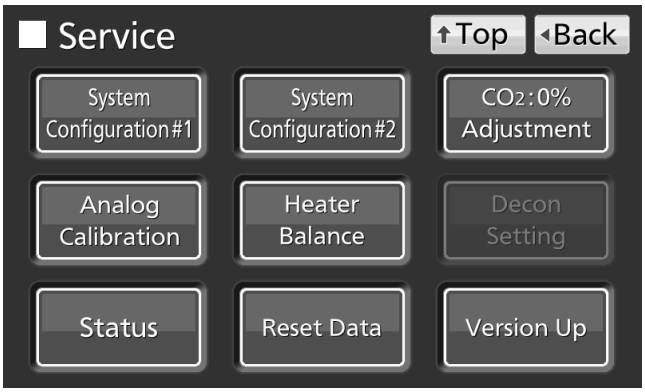
2. Input “384” and press OK key on the “Service code” screen.
Note: If the wrong service code is entered, the “Notice” message is displayed and return to the “Top” screen.
In this case, execute Step1 and input the correct service code.
The service code can’t change by setting menu.



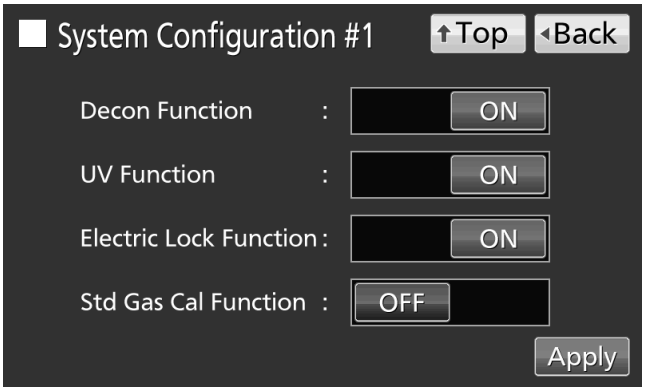
3. The “Menu” display will appar and the service key (Service) will be active.
Press the service key (Service).



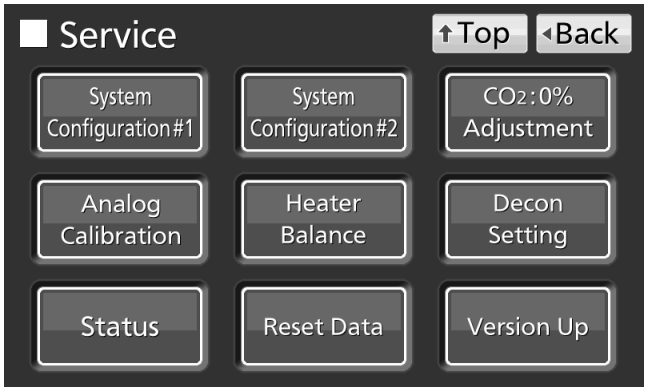
4. The “Service” display will appar.
Press the system configuration #1 key (System Configuration#1).



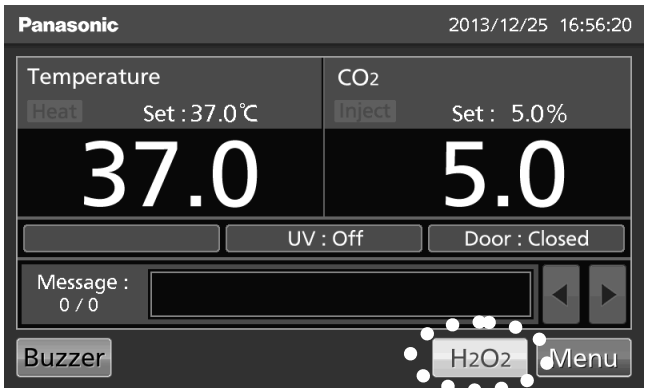
5. Slide the slide key of the item “Decon Function” to the right on the “System Configuration#1” screen.
Then the item setting “Decon Function” turns on. (At one time, the item settings “UV Function” and “Electric Lock Function” turn on.)
Press the apply key (Apply).



6. Press the top key (Top) on the “Service code” screen, and return the “Top” screen.



7. Check the H_2O_2 key appearing at the bottom right of the “Top” screen.



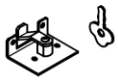
8. See the manual for setting of the electrical key, the UV lamp and the decontamination.

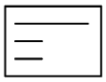
MCO-170EL Installation procedures

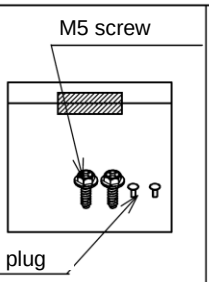
Electric lock installation procedures of MCO-230AIC/UV is mentioned below.
Please follow below procedures to install.

Used parts
Confirm below parts are completed as accessories first.
We make sure to pack the products, but if there is any parts missing or fault, please contact sales office or vendor.


Electric lock

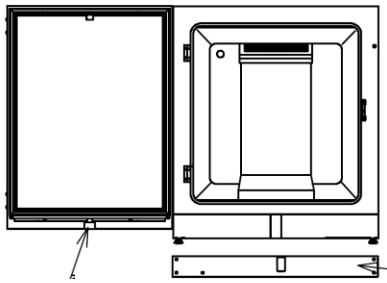

Key


Electric lock caution label

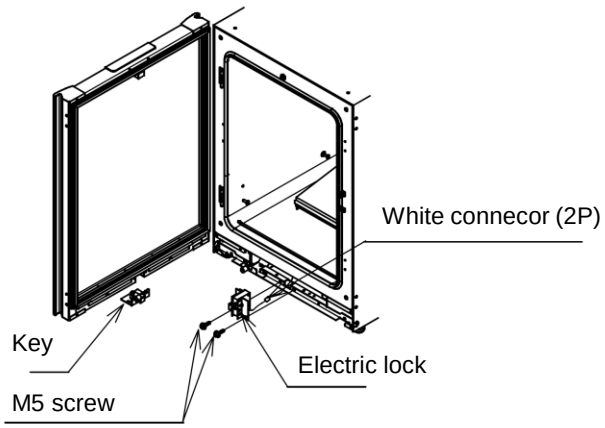


Used tool

- Screw driver
- 8mm box wrench



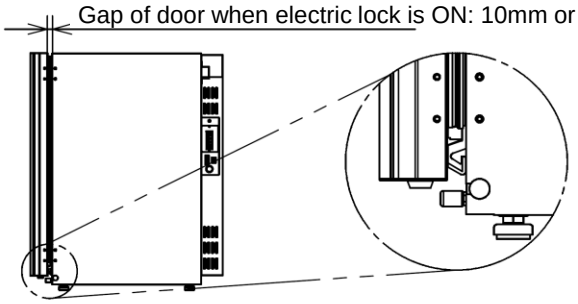
1. Remove cover on back of interior, cover under frame (2pcs) and cover under door.
   Put M4 hole plug into hole of cover under frame support.



2. Connect electric lock connector and white connector under frame and install to angle, then install key to under door.

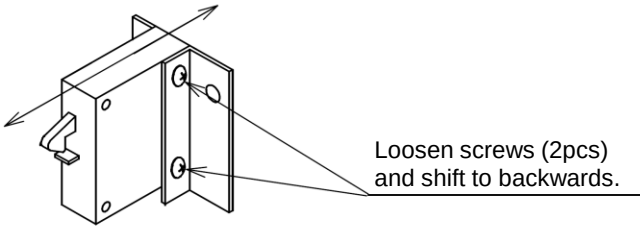
Note) Use removed screws except electric lock.

MCO-170EL Installation procedures 2

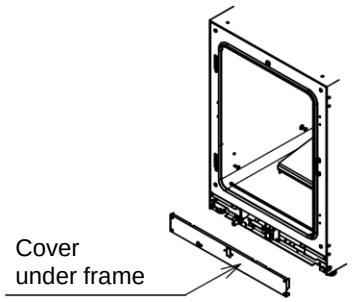


3. Close the door and confirm if it can be locked properly. Also check the gap of door.

Note) Electric lock cannot work if the unit is power supplied.
When used key to unlock during power failure, pull out the key after turning towards unlocking direction with outer door opened.
It cannnot be turned towards unlocking direction with outer door closed.

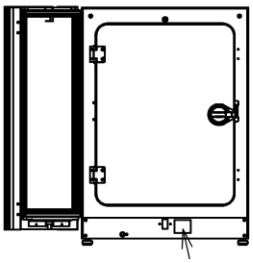


4. Adjust electric lock if it cannot be locked.



5. Install cover under frame.

Stick name plate, electric lock caution label on below position.

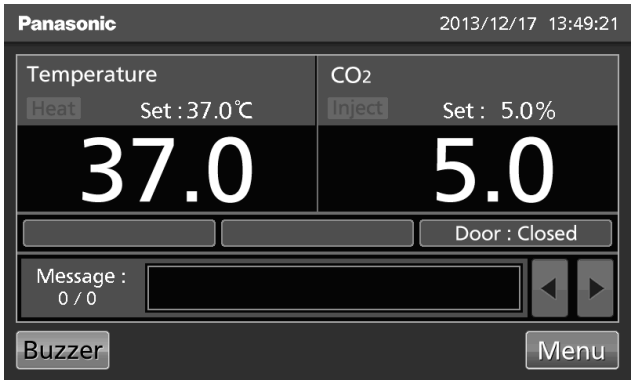


Initial procedures of MCO-170EL (MCO-230series)

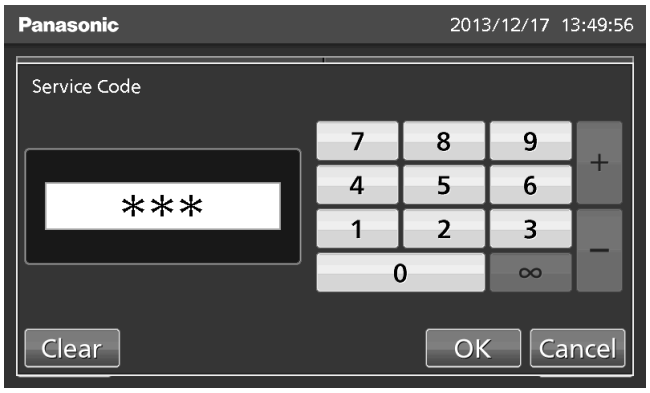
・Setting of the electric lock option using the control panel

After electric lock “MCO-170EL” is installed, use the following procedure to enable the decontamination option.

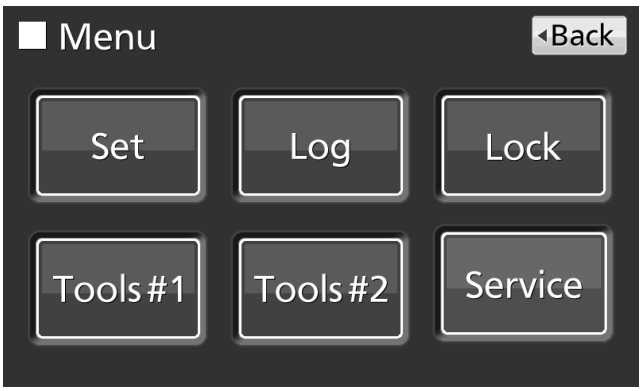
1. By pressing the munu key (Menu) 5 seconds or more of the “Top” screen, the “Service code” screen is displayed.



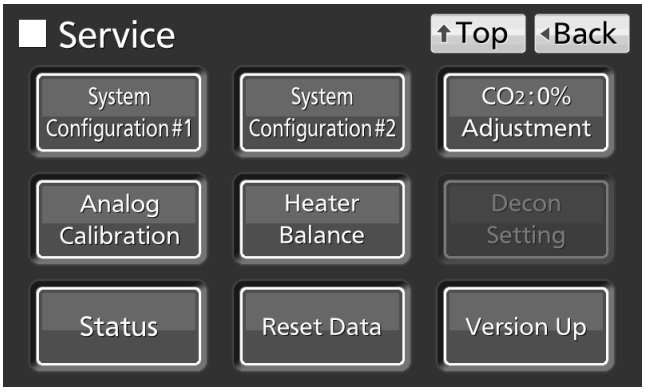
2. Input “384” and press OK key on the “Service code” screen.
Note: If the wrong service code is entered, the “Notice” message is displayed and return to the “Top” screen.
In this case, execute Step1 and input the correct service code.
The service code can’t change by setting menu.



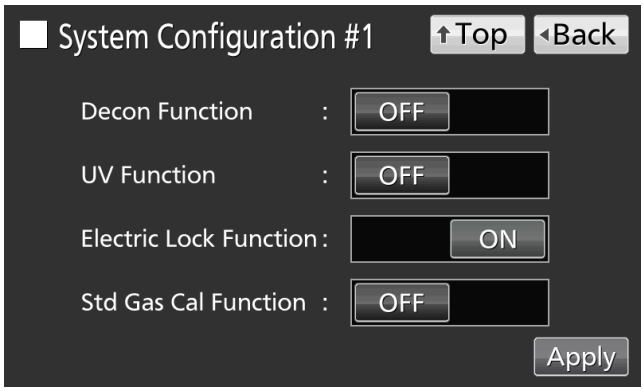
3. The “Menu” display will appar and the service key (Service) will be active.
Press the service key (Service).



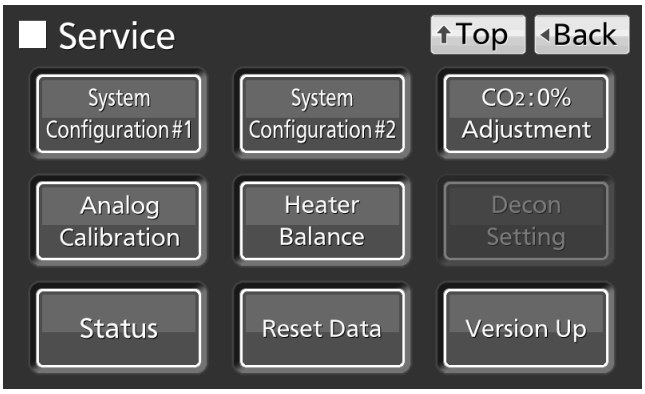
4. The “Service” display will appar.
Press the system configuration #1 key (System Configuration#1).



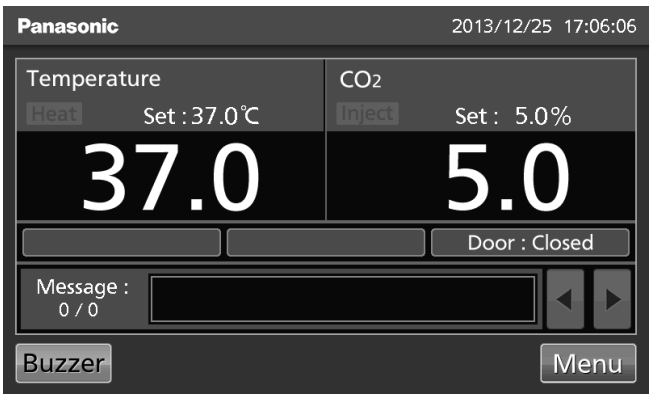
5. Slide the slide key of the item “Electric Lock Function” to the right on the “System Configuration#1” screen.
Then the item setting “Electric Lock Function” turns on. Press the apply key (Apply).



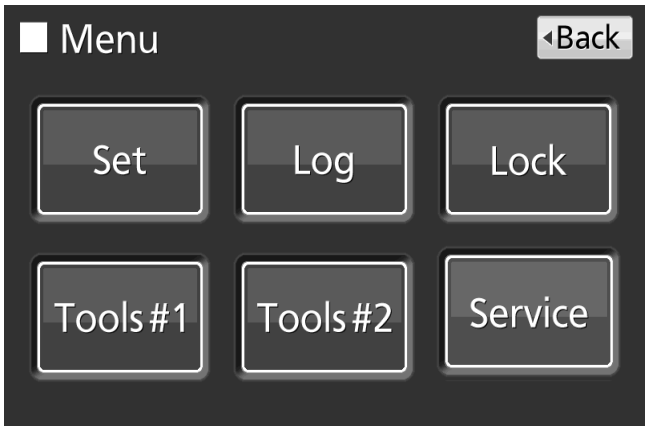
6. Press the top key (Top) on the “Service code” screen, and return the “Top” screen.



7. Press the menu key (Menu).

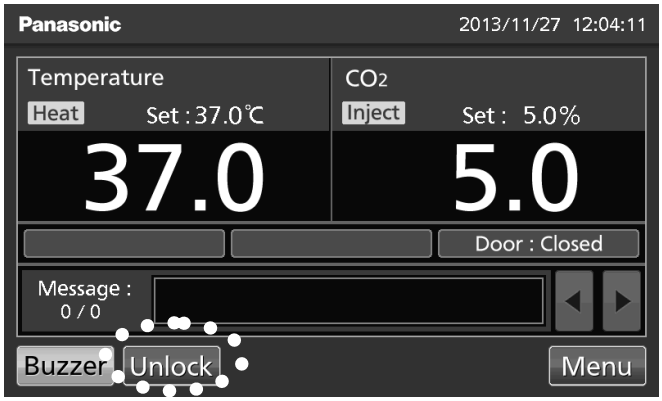


8. By pressing the lock key (Lock) of the “Menu” screen, the “Stand-by Setting” screen is displayed.



9. Slide the slide key of the item “Auto-lock” to the right on the “Stand-by Setting” screen. Then the item setting “Auto-lock” turns on. Press the apply key (Apply), and return the “Menu” screen.

10. Check the Unlock key appearing at the bottom left of the “Top” screen.



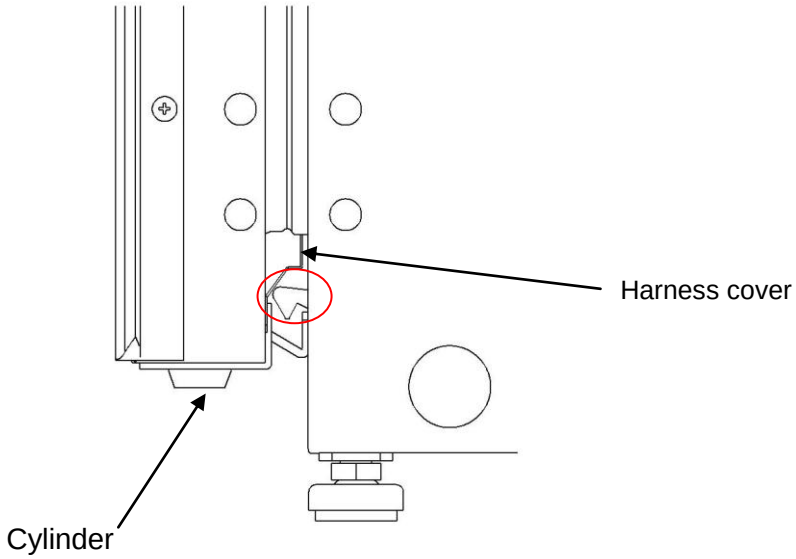
11. See the manual for setting of the thereafter procedure.

MCO-170EL Adjustment procedures

When electric lock does not work or difficult to lock during installation, please follow below procedures to adjust.

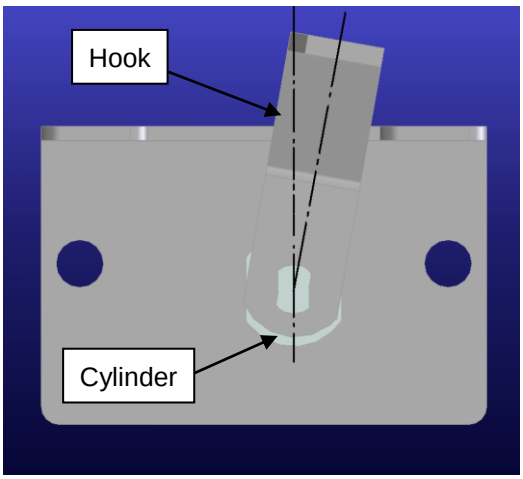
* When the hook on unit side hits to harness cover on door side and it cannot be locked.

Loosen M4 screws (2pcs) fixing harness cover and move harness cover upward.
If the harness cover hits to door gasket and cannot move upward, loosen hinge of door and move the door upward.

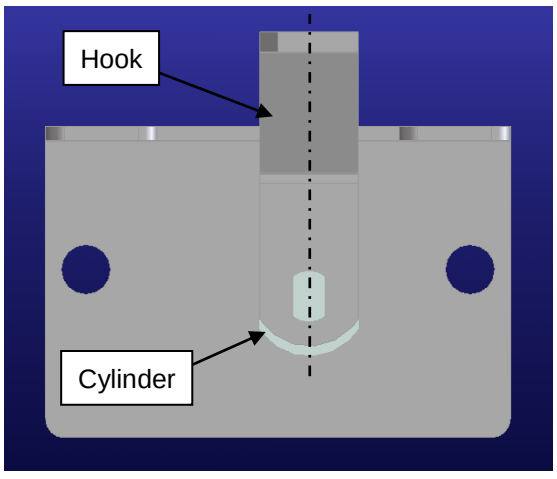


* When the hook on unit side does not hit to harness cover, but it cannot be locked.

1. Remove cylinder with mounting plate on lower side of door and confirm the hook position.
2. If the hook position is not good like below picture, loosen nut fixing cylinder and fix it again to the hook become staright.



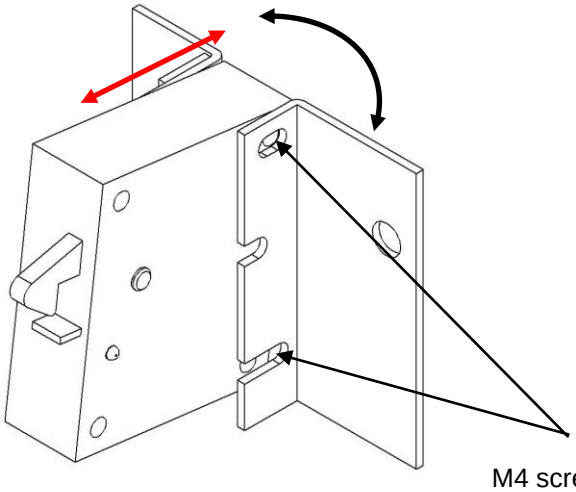
NG: Hook leans



OK: Hook is straight

* When the hook on door side hits to electric lock on unit side and the door cannot be closed or hook can be easily released.

If loosen M4 screws (2pcs) in below position of electric lock with installing to unit, electric lock can be moved both front and rear, so adjust to proper position and fix it.

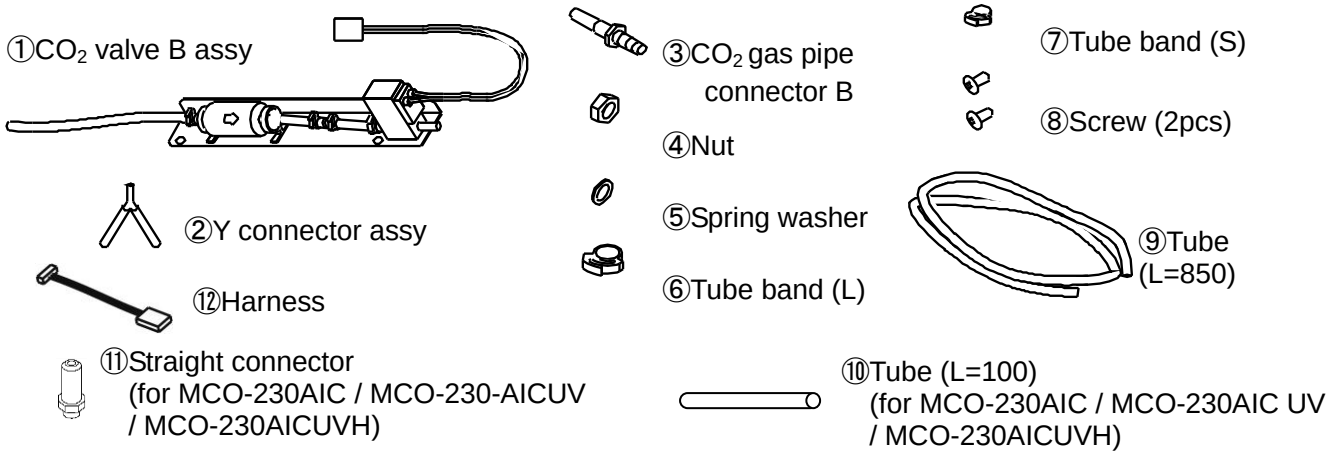


MCO-21GC Installation manual

This manual is for below models. Please confirm model before installing.

- MCO-230AIC
- MCO-230AICUV
- MCO-230AICUVH

Accessories



Before installing

Please follow below operation before installing to MCO-230AIC series.

1. Remove clamping band of ①CO_2 valve assy, then remove tube and capillary (Figure 1).

2. Remove IN side straight connector of valve, then replace to ⑪Straight connector. Make sure to fix it in order to prevent gas leakage.

3. Install ⑩Tube (L100) instead and fix it by clamping band removed in above No.1. Make sure to fix it in order to prevent gas leakage.

4. Replace tube of filter to ⑨Tube (L850) Fix it by removed clamping band. Make sure to fix it in order to prevent gas leakage. Connect ⑫Harness to valve.

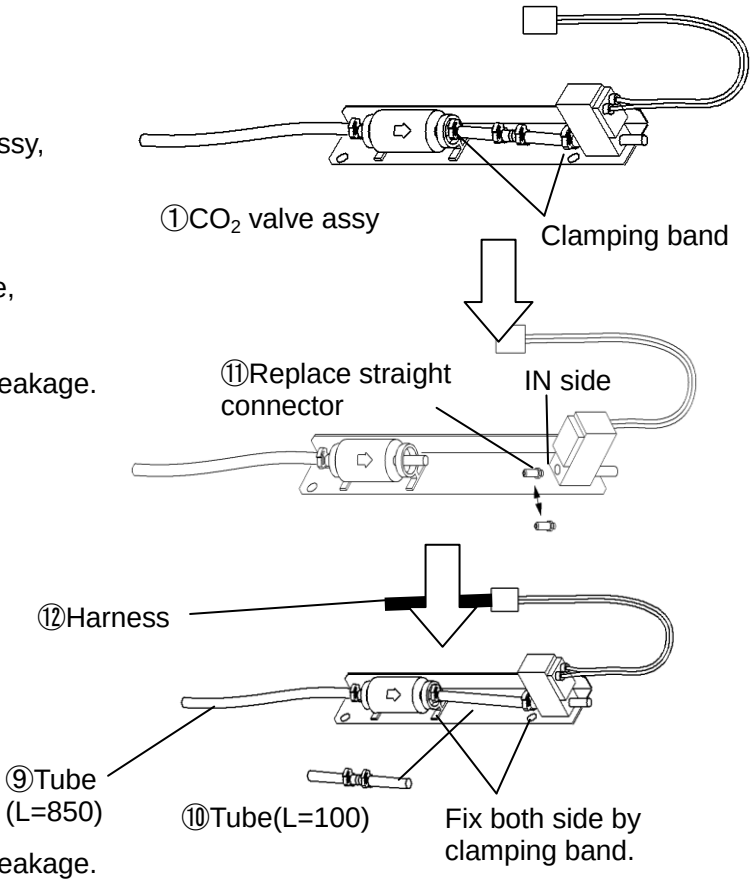


Figure 1

Install procedures

1. Remove power code and make sure power is not supplied to unit.
2. Remove rear cover (Figure 2).

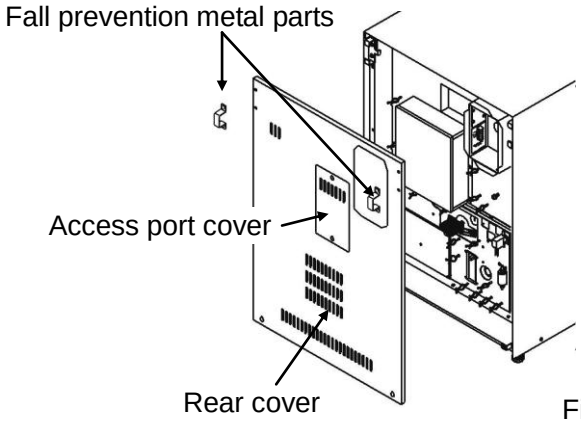


Figure 2

3. Install ①CO_2 valve B assy to the position instructed inside rear cover (Figure 3) using ⑧Screw.
4. Remove upper side tube of CO_2 valve A and connect CO_2 valve A, CO_2 valve B assy and tube X using ②Y connector assy (Figure 3-1).
5. Connect lead wire of CO_2 valve B to CN5 on main PCB.

Note: Make sure to connect all tube properly in order to prevent gas leakage.

Figure 3

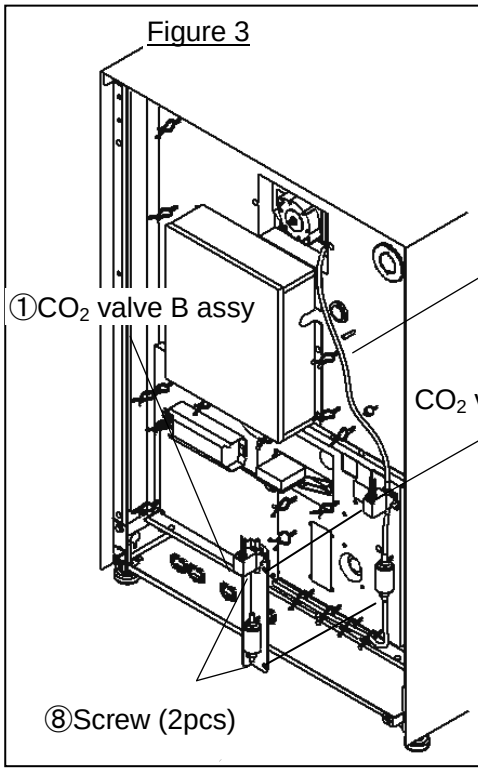
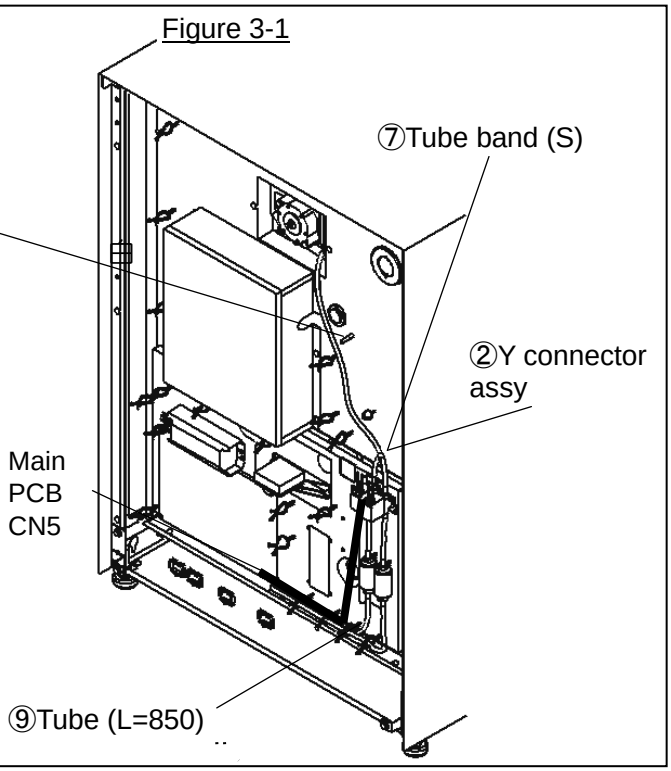


Figure 3-1



6. Remove side lower cover, then remove power mounting plate inside.

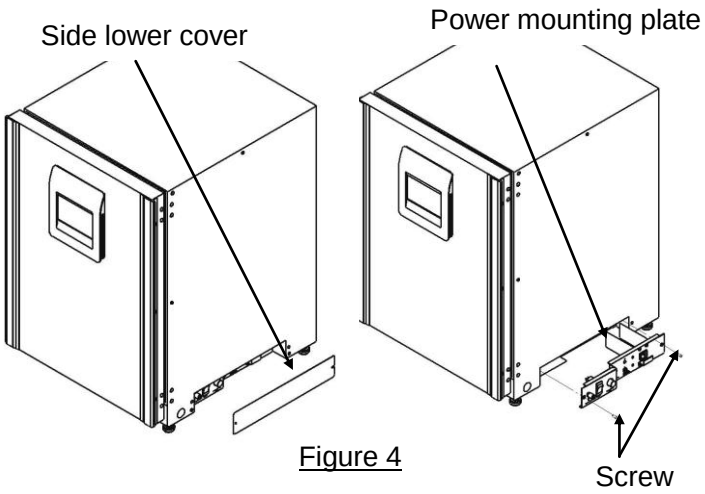


Figure 4

7. Let tube (L=850) through under the unit to power mounting plate.

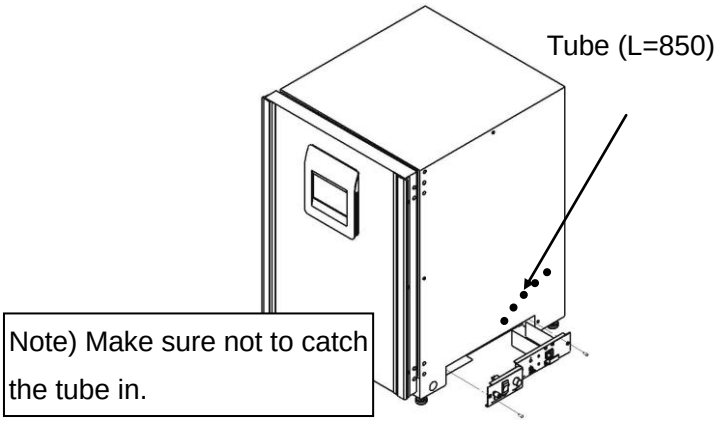


Figure 5

8. Remove CO_2 gas B cap on power mounting plate. Tighten ③CO_2 gas pipe connector B using ④Nut and ⑤Spring washer. Then Put ⑨Tube (L=850) into tube joint and fix it by clamping band.

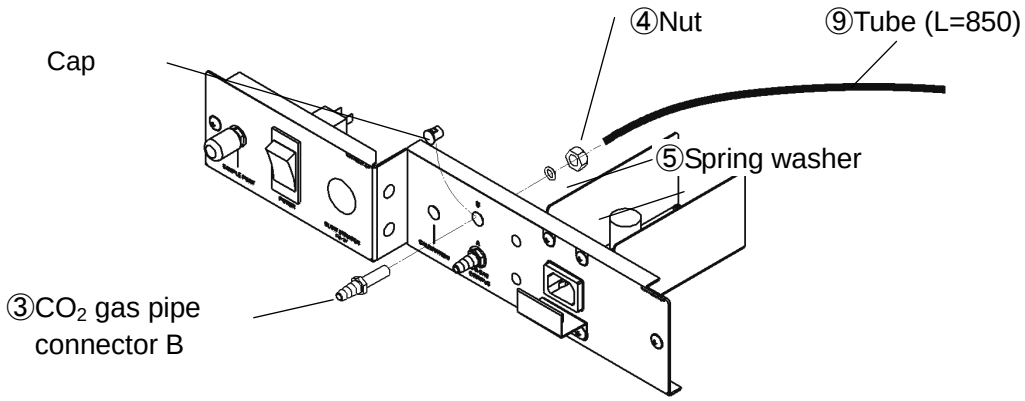


Figure 6

9. Return power mounting plate.

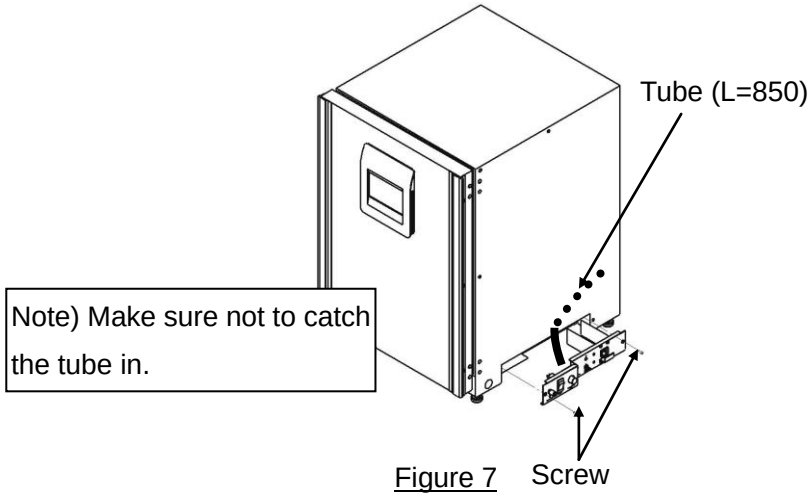


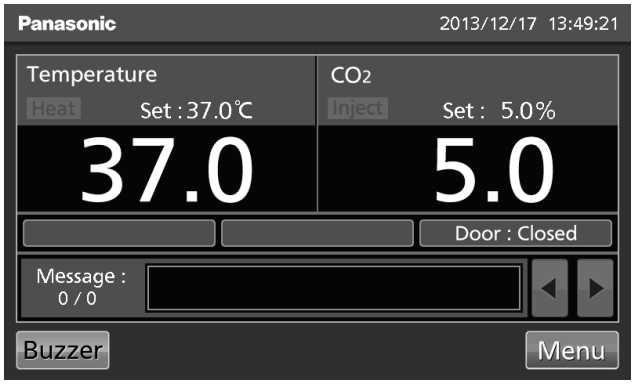
Figure 7

10. Return rear cover.

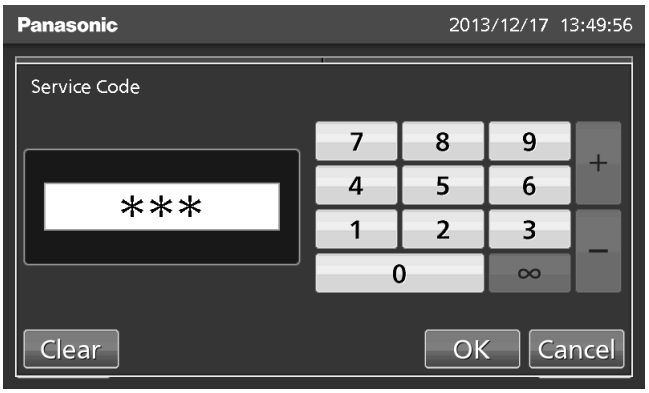
11. CO_2 gas auto exchanger setting on control panel

After installing CO_2 gas auto exchanger, please follow below setting on control panel.

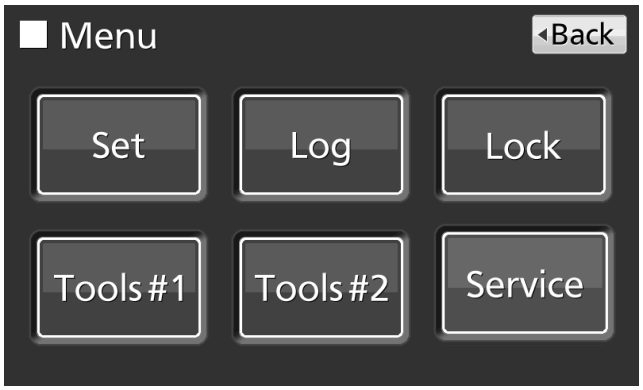
1. Press Menu key more than 5 sec. at top display to move to Service code display.



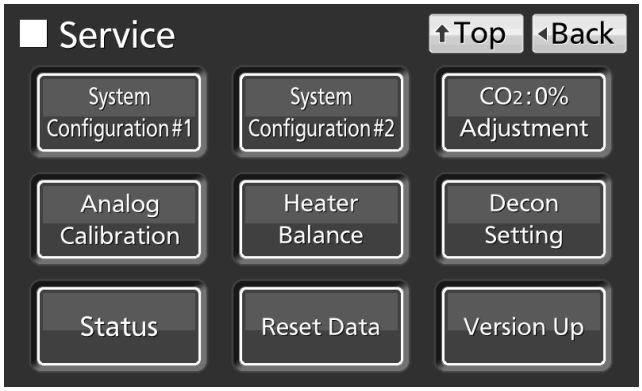
2. Input “384” at Service code display and press OK key.
(Note) If incorrect service code is input, “Notice” is displayed and return to 1. top display.
Input correct service code again.
(service code cannot be changed)



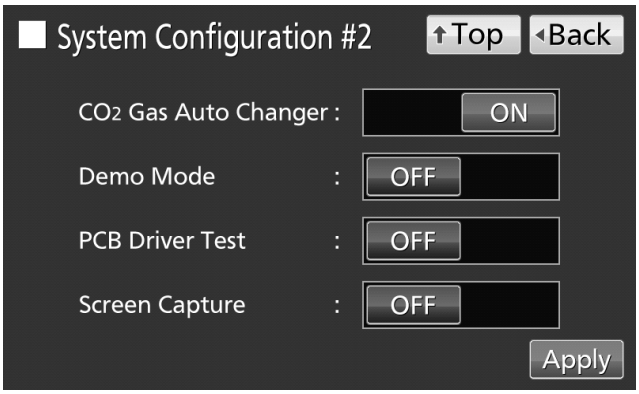
3. Move to Menu display and Service key can be pressed.
Press Service key.



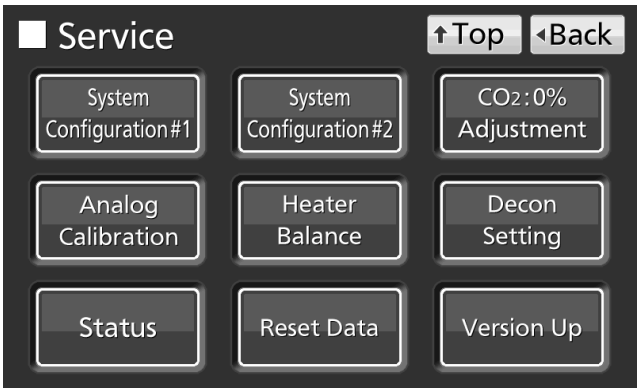
4. At Service display, press System Configuration#2 key.



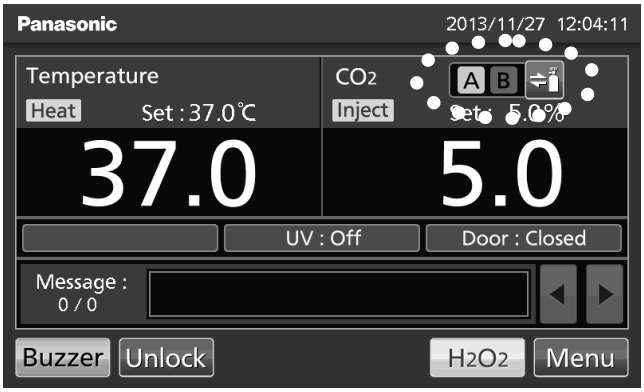
5. At System Configuration#2 display, slide CO_2 Gas Auto Changer key to right side and make it ON and press Apply key.



6. Press Top key at Service display to return to Top display.



7. Confirm “AB” is displayed above CO_2 density display at Top display.



Operation check procedures

Please follow below procedure to check operation after installing gas auto exchanger.

	Procedure
1	Stop CO_2 gas supply of gas cylinder A and supply CO_2 gas from only cylinder B.
2	Power ON the unit and set chamber temperature 37.0℃, CO_2 density 0.0%. Confirm gas cylinder A is selected. (In case of MCO-230AIC: Confirm CO_2 gas supply lamp A is lighted)
3	Wait for about 1 hour to make the unit can control CO_2. (It takes about 1hour that the unit can control CO_2 from power ON)
4	Set CO_2 density at 5% and confirm CO_2 INJECT lamp is lighted. Note: It may take more than 1 hour to make the unit can control CO_2 because of its environment such as ambient temperature and CO_2 INJECT lamp is not lighted.
5	Confirm “E01” (CO_2 gas empty alarm) is displayed and buzzer sound come out after 2~7min. from CO_2 INJECT lamp is lighted. Confirm gas cylinder is switched from A to B. (In case of MCO-230AIC: Confirm CO_2 gas supply lamp A blinks and B lights)
6	Confirm CO_2 density display increases to set point 5% and control properly. Note: If the decimal point of CO_2 density display is blinking, it means CO_2 sensor is automatically calibrated and CO_2 control is stopped.
7	End of checking procedures. Stop CO_2 supply of both cylinder A and B. Press BUZZER key to erase “E01”. Return to gas cylinder A is selected. (In case of MCO-230AIC: Pr  key at CO_2 gas supply selection)

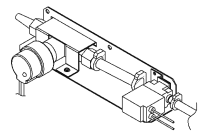
Please refer to instruction manual about how to use gas auto exchanger.

MCO-SG Installment procedures

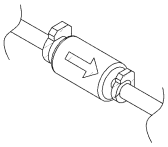
This installment procedure is for below models. Please confirm the model before installing.

- MCO-230AIC
- MCO-230AICUV
- MCO-230AICUVH

Accessories

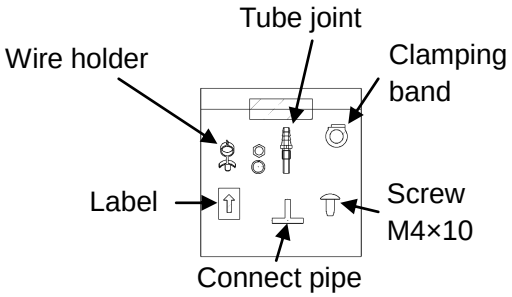


①Valve mounting plate



②Filter

③Harness



Installment procedure

1. Remove power code and confirm the power does not supply to unit.

2. Combine ①Valve mounting plate and ②Filter based on below direction. Then, fix them by clamping band.

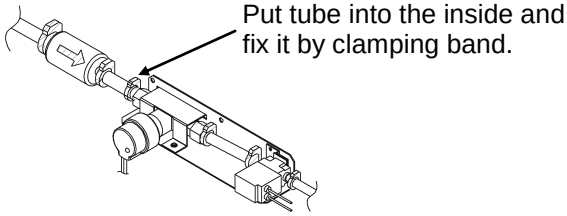


Figure 1

3. Remove rear cover and CO_2 sensor box in Figure 2.

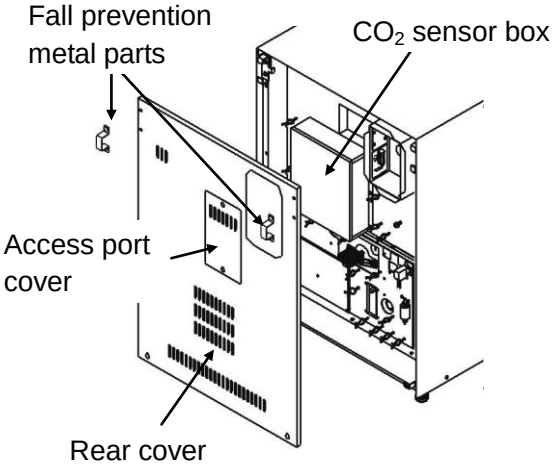


Figure 2

4. Cut the tube (30mm) in CO_2 sensor box and put connect pipe in based on below direction.

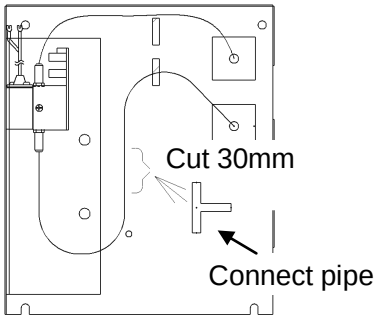


Figure 3

5. Put wire holder (2pcs) in back of unit and paste label between them based on below direction.

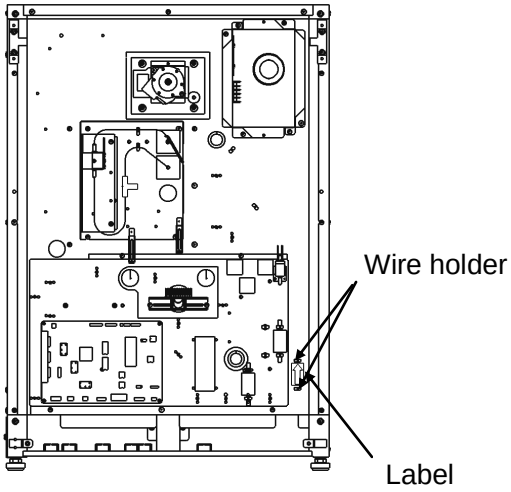


Figure 4

6. Remove bottom side cover and power mounting plate inside.

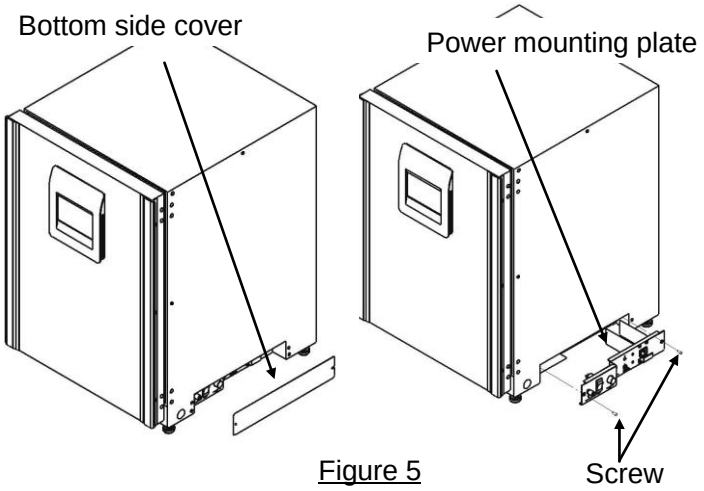


Figure 5

7. Remove CALIBRATION cap of power mounting plate. Then, tighten tube joint by nut and washer. Put tube into tube joint and fix them by clamping band.

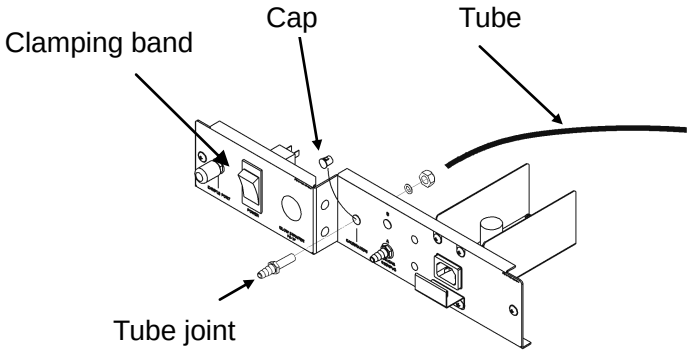


Figure 6

8. Let tube through under the unit to rear side. Return power mounting plate.

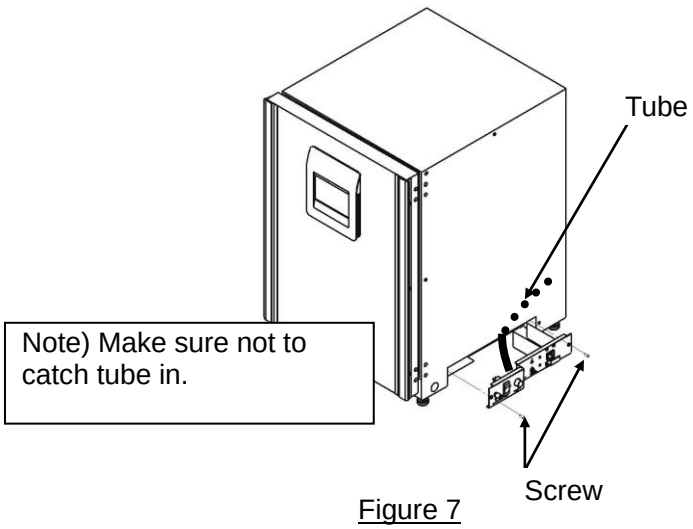


Figure 7

9. Install assembled Valve mounting plate at section 2. using attached screws and connect each tube.

Connect each connector using attached lead wire.

Connect CN8 on PCB side.

Please refer to figure 8 about wiring.

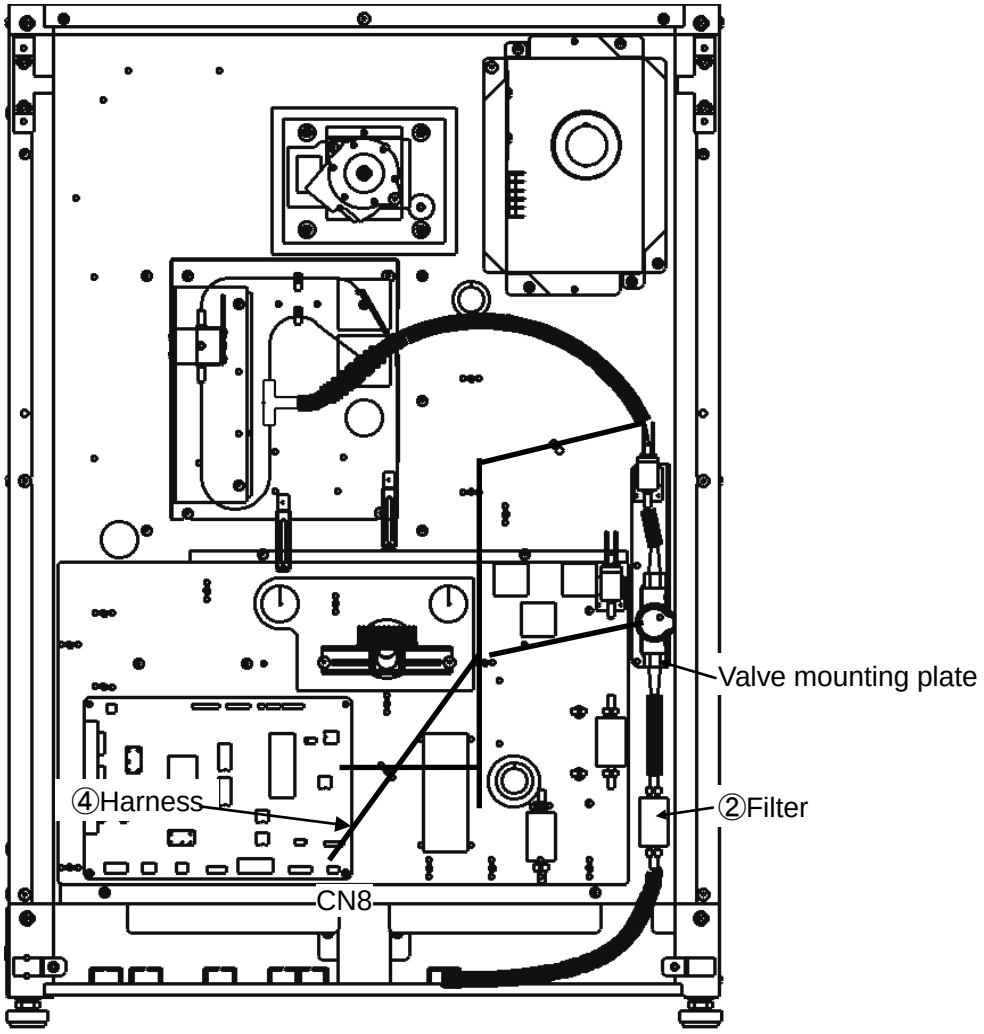
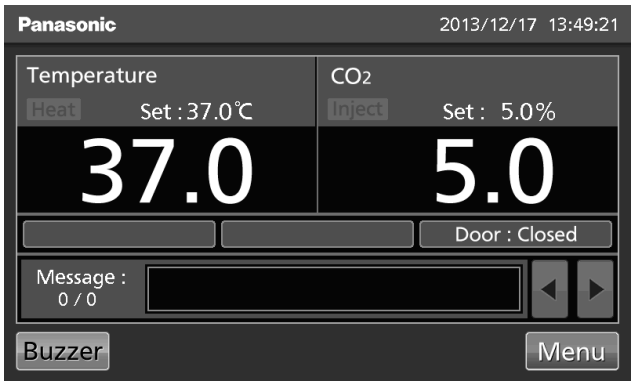


Figure 8

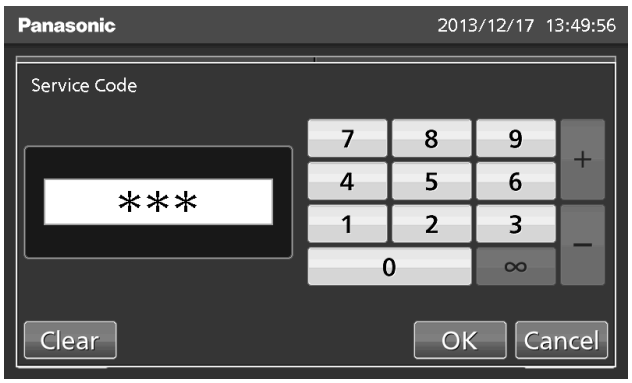
10. Standard gas auto calibration setting on control panel

After installing Standard gas auto calibration kit, please follow below setting on control panel.

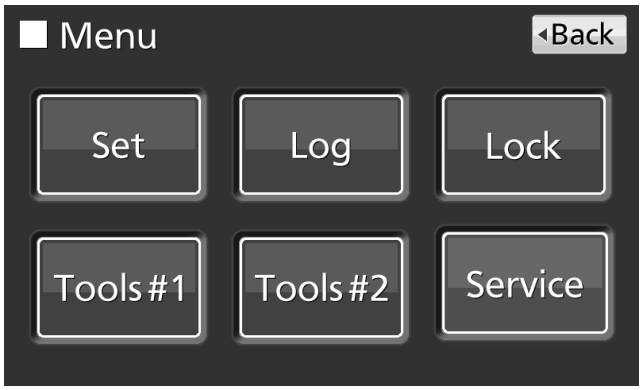
1. Press Menu key more than 5 sec. at top display to move to Service code display.



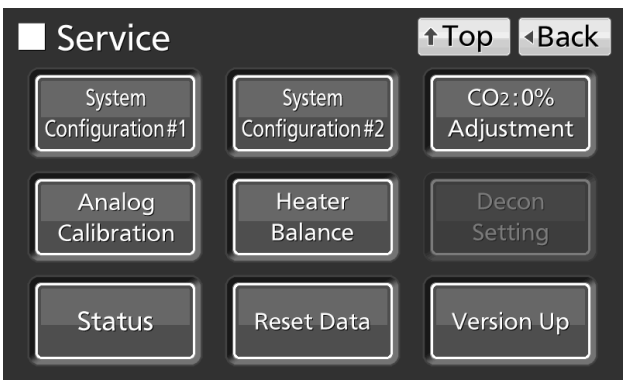
2. Input “384” at Service code display and press OK key.
(Note) If incorrect service code is input, “Notice” is displayed and return to 1. top display.
Input correct service code again.
(service code cannot be changed)



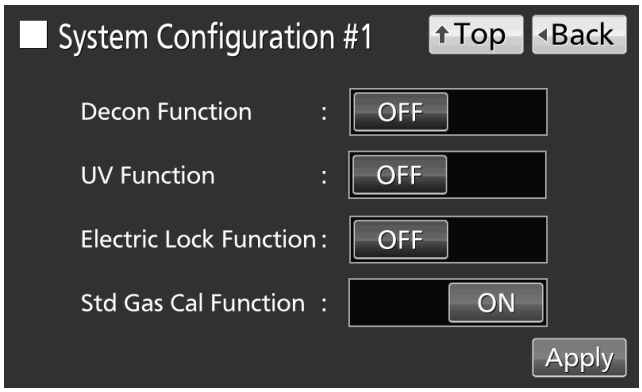
3. Move to Menu display and Service key can be pressed.
Press Service key.



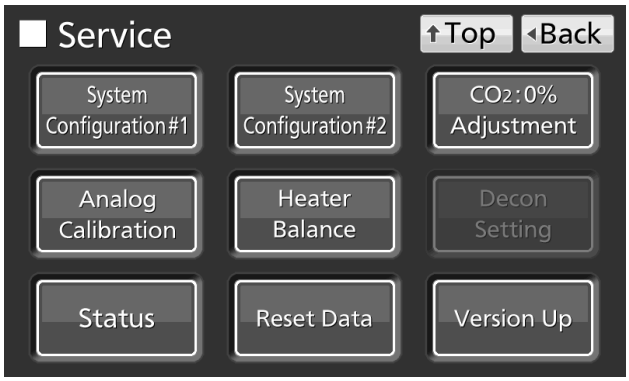
4. At Service display, press System Configuration#1 key.



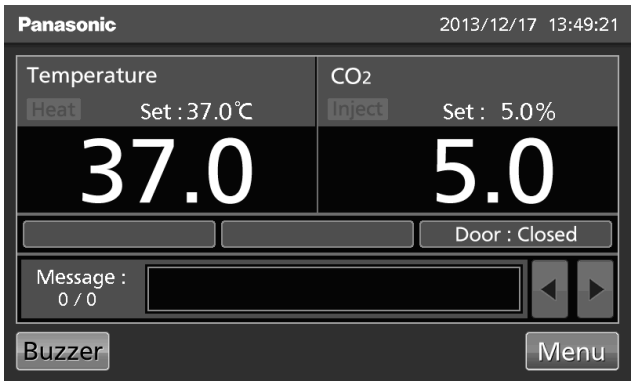
5. At System Configuration#1 display, slide Std Gas Cal Function key to right side and make it ON and press Apply key.



6. Press Top key at Service display to return to Top display.



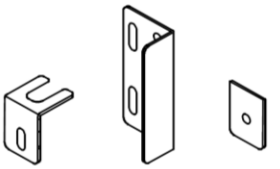
7. Please refer to instruction manual about settings afterwards.



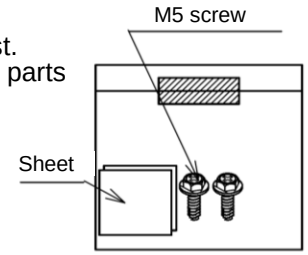
MCO-170PS Installation procedures

Double stacking procedures of both upper and lower are MCO-230AIC is mentioned below.
Please follow below procedures to install.

Used parts
Confirm below parts are completed as accessories first.
We make sure to pack the products, but if there is any parts missing or fault, please contact sales office or vendor.

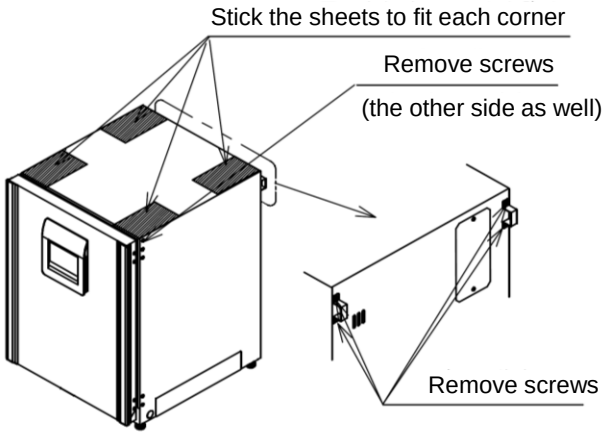


Metal fitting
3 types (2pcs each)

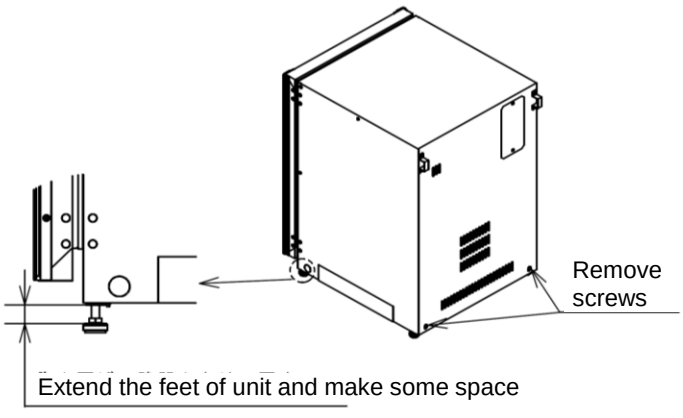


Used tool

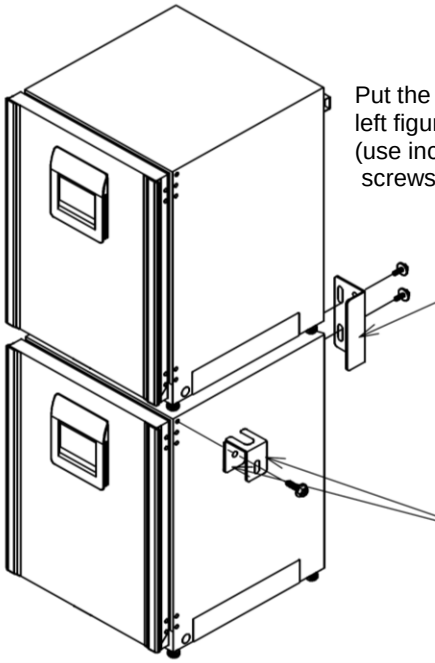
- Screw driver
- 8mm box wrench



Lower unit preparation



Upper unit preparation



Put the unit on and fix them using metal fittings like left figure.
(use included screws for front side and removed screws for rear side)

Metal fitting
(the other side as well)

Metal fitting
(the other side as well)

7FB6P104120000

MCO-230SB Installation Procedures

Double stacking procedures of both upper and lower are MCO-230AIC is mentioned below.Please follow bellow procedures to install.

The term "MCO series" here are MCO-20AIC,18AIC,18M,18AIC,19AIC and ,19M, includeing prodcts installed

Used

Confirm bellow parts are completed as accessories first.We make sure to pack the products, but if there is any parts missing or fault, pleqse contact sales office or vendor

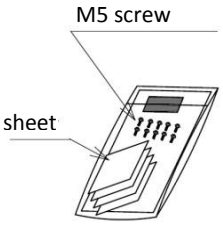
stacking

metal fitting

front/rear 4pcs

rear A 2pcs

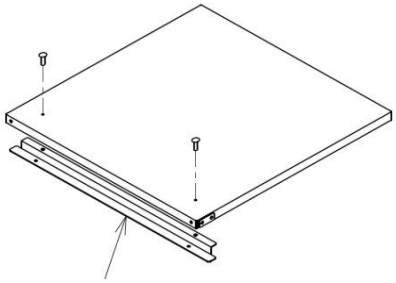
rear 2pcs



Used tool

- Screw driver
- 8mm box wrench

1.Remove metal fitting that is

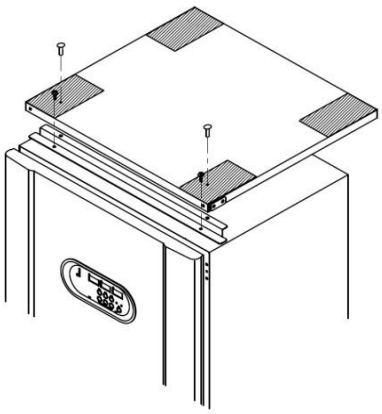


metal

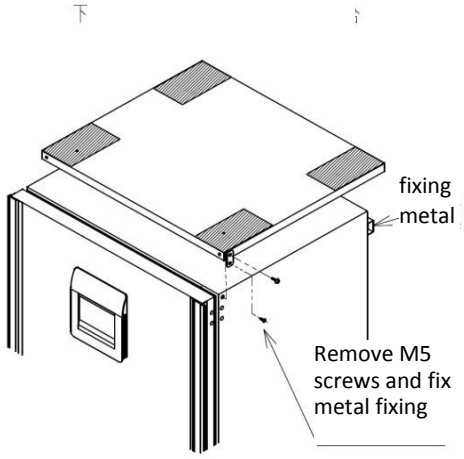
2.Depending on the lower part product, the fixing method is different.
Please refer below figure,install satcking bases

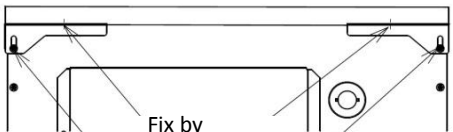
Note) If MCO-230 series is lower,the metal fittings removed at 1 is unused.

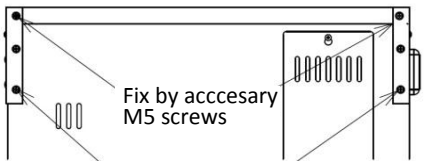
MCO-20AIC is put



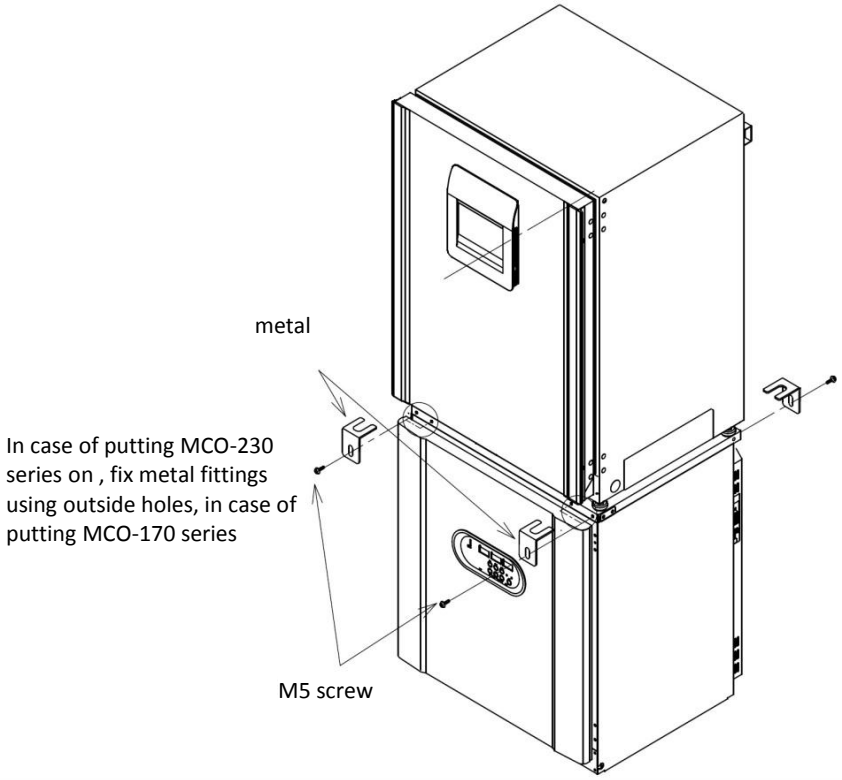
MCO-230AIC is



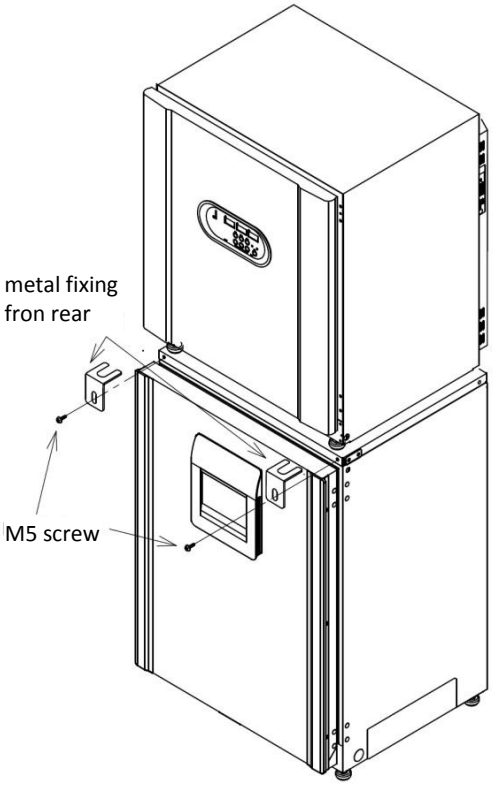


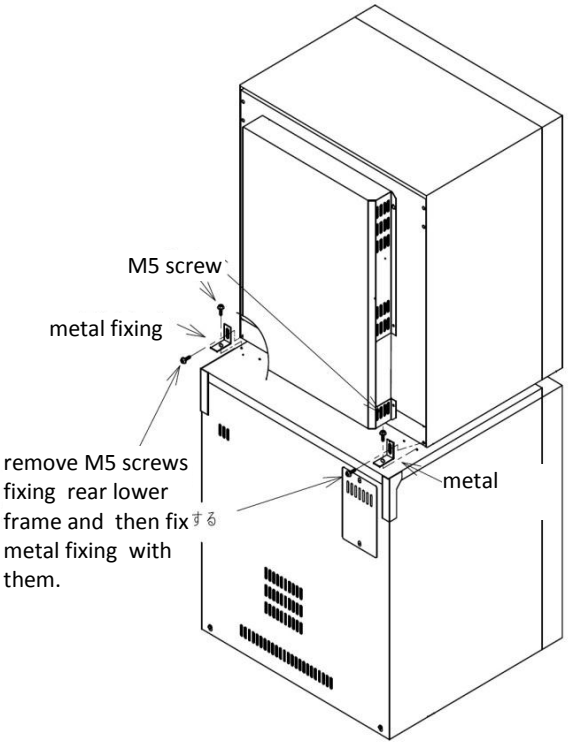


Upper : MCO-230/170 series + Lower : MCO-20AIC

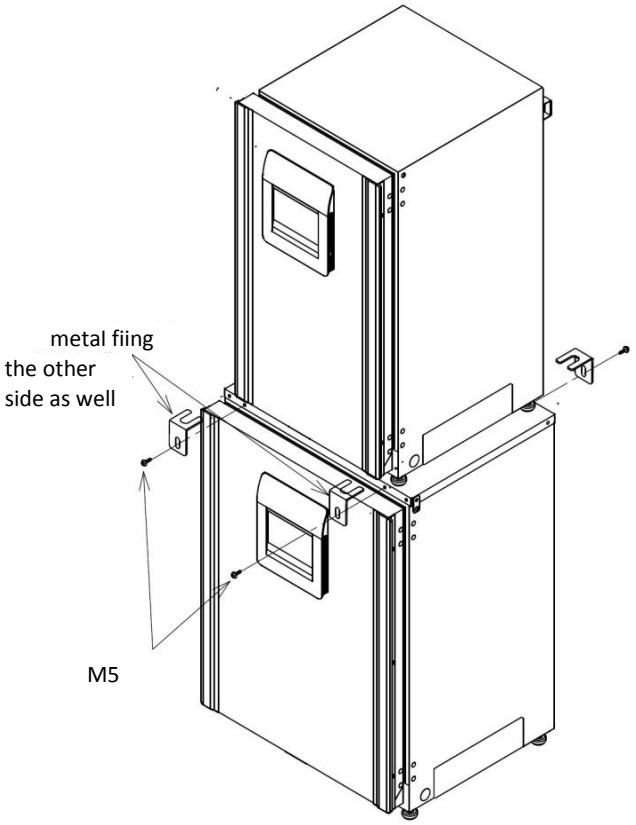


Upper : MCO series + Lower : MCO-20AIC





Upper : MCO-170 series + Lower : MCO-230AIC

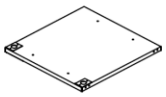


MCO-230RB Installation procedures

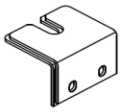
Assemble procedures of MCO-230RB is mentioned below.
Please follow below procedures to install.

Used parts

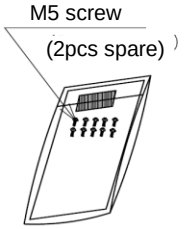
Confirm below parts are completed as accessories first.
We make sure to pack the products, but if there is any parts missing or fault, please contact sales office or vendor.



Roller base

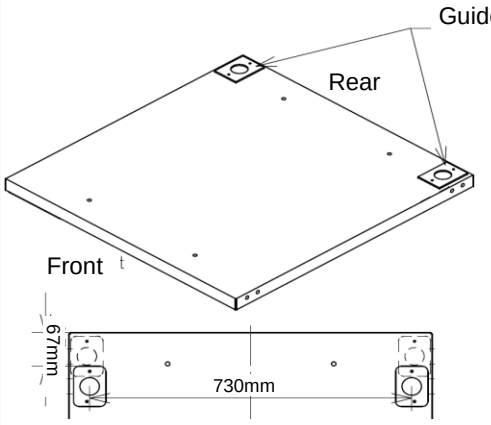


Metal fitting 4pcs



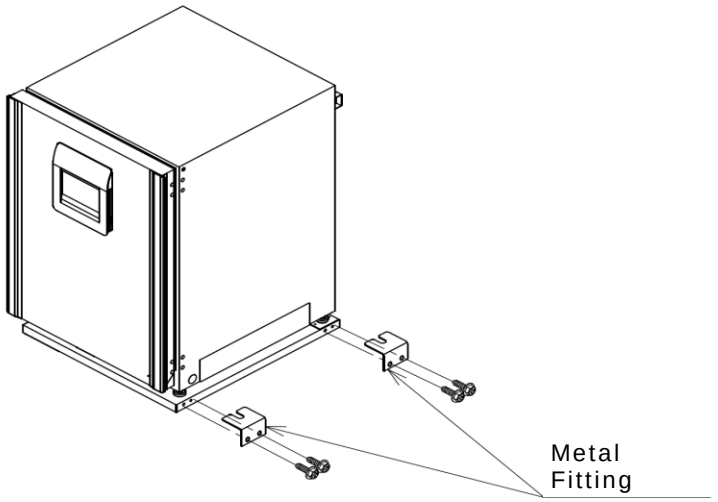
Used tool

- Screw driver
- 8mm box wrench



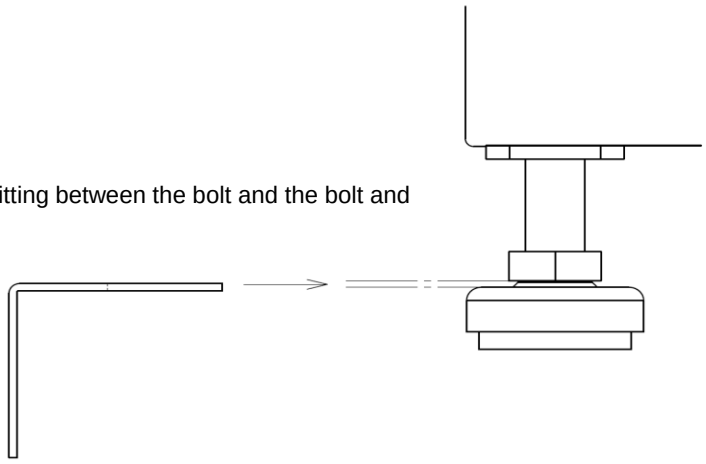
When MCO-20AIC series are put on, change guide plate to inner side.
In case of MCO-230AIC series, no need to change guide plate.

Unit preparation



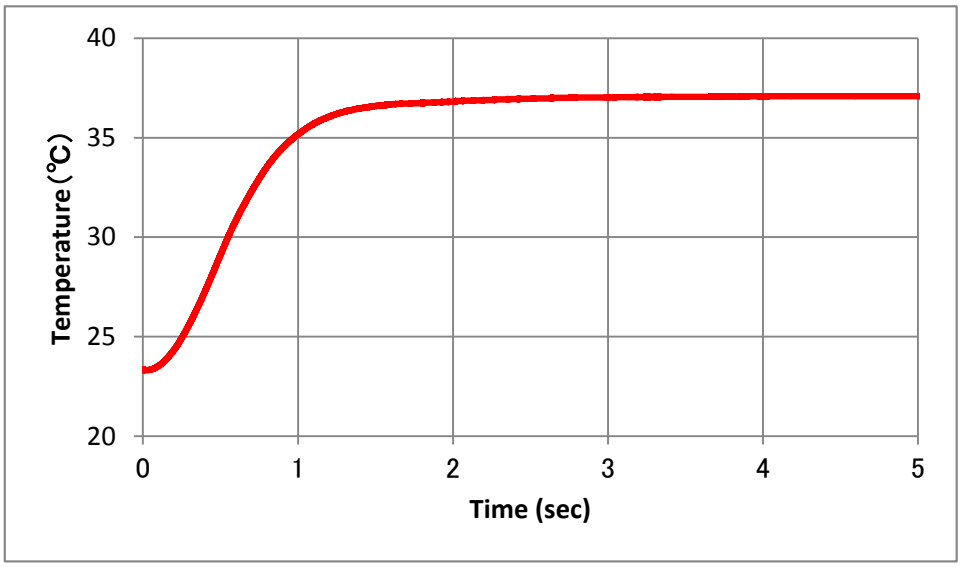
Put the unit and fix using metal fittings like left figure.(use i ncluded screws)f

Insert the metal fitting between the bolt and the bolt and the cap.

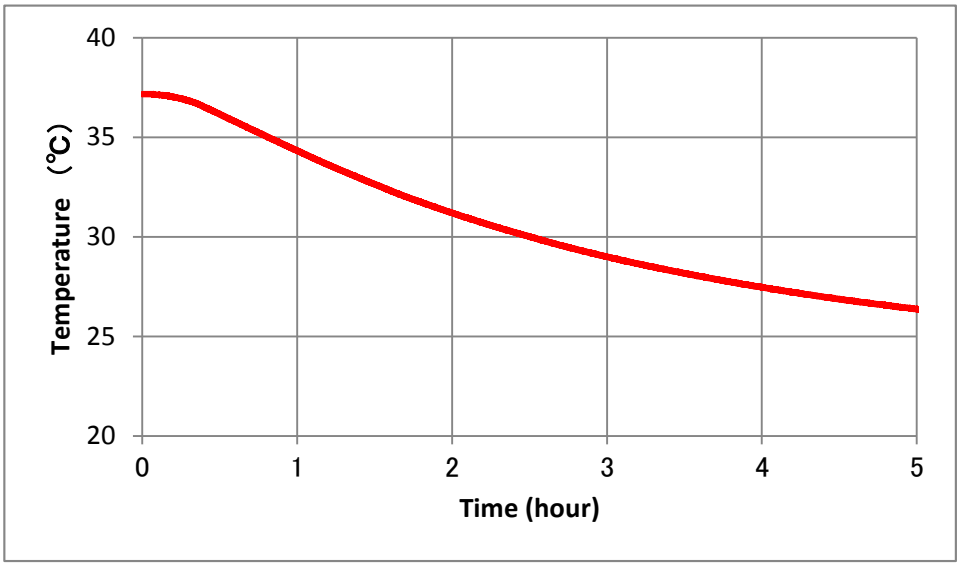


Test Data

Temperature pull-up SV=37℃/AT=23℃



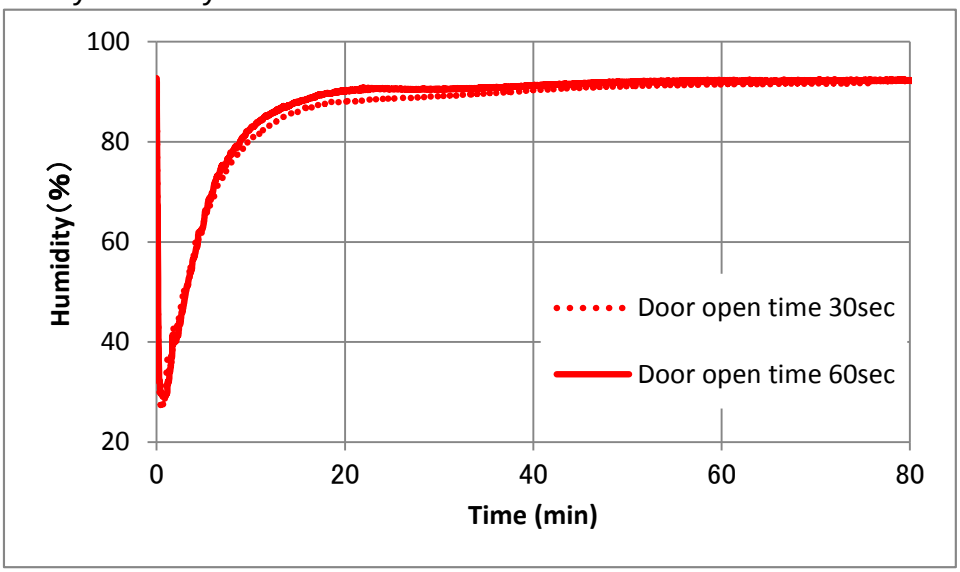
Temperature reduction in power failure SV=37℃/AT=23℃



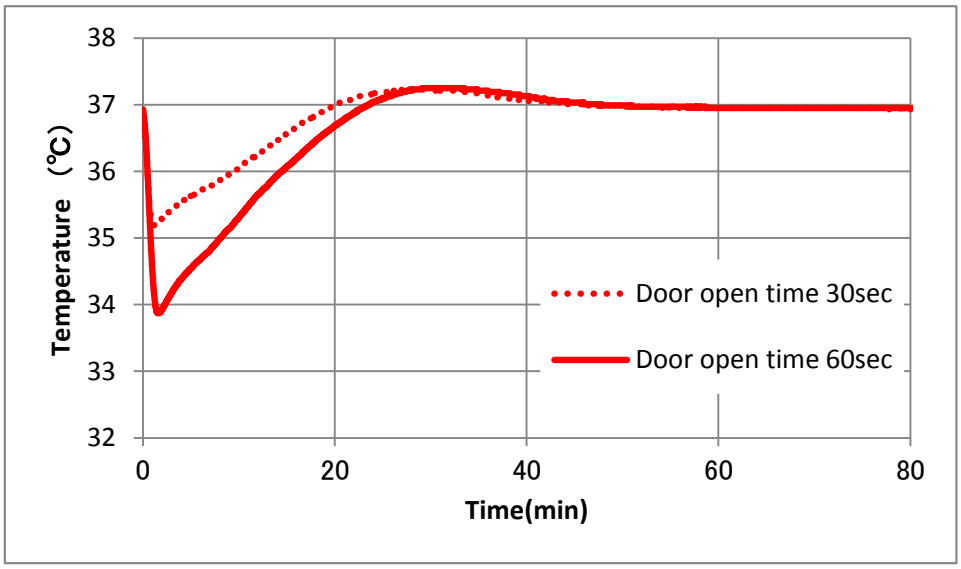
Humidity/temperature/CO2 recovery SV=37℃/AT=23℃/CO2=5%

Dotted line: door open 30 sec. Solid line: door open 60 sec.

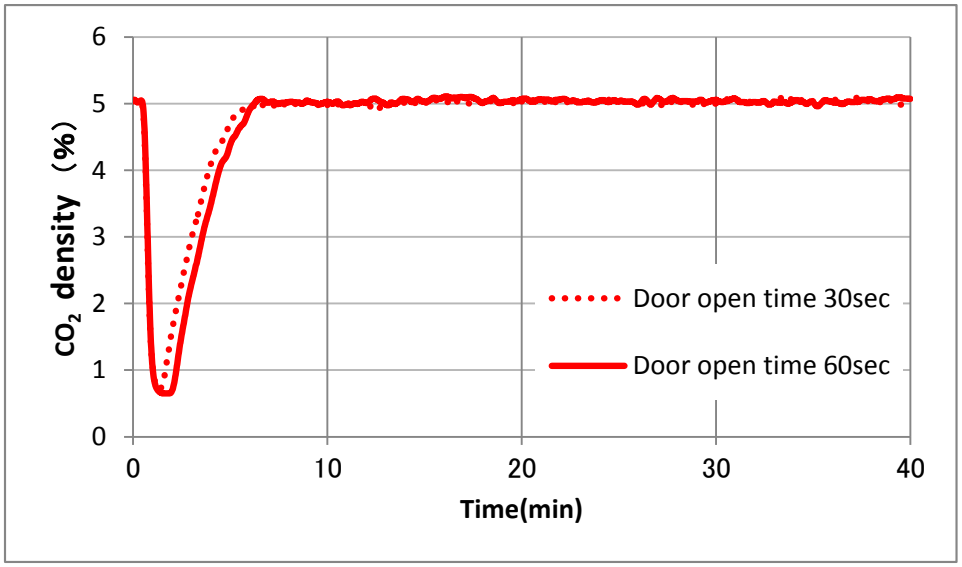
Humidity recovery

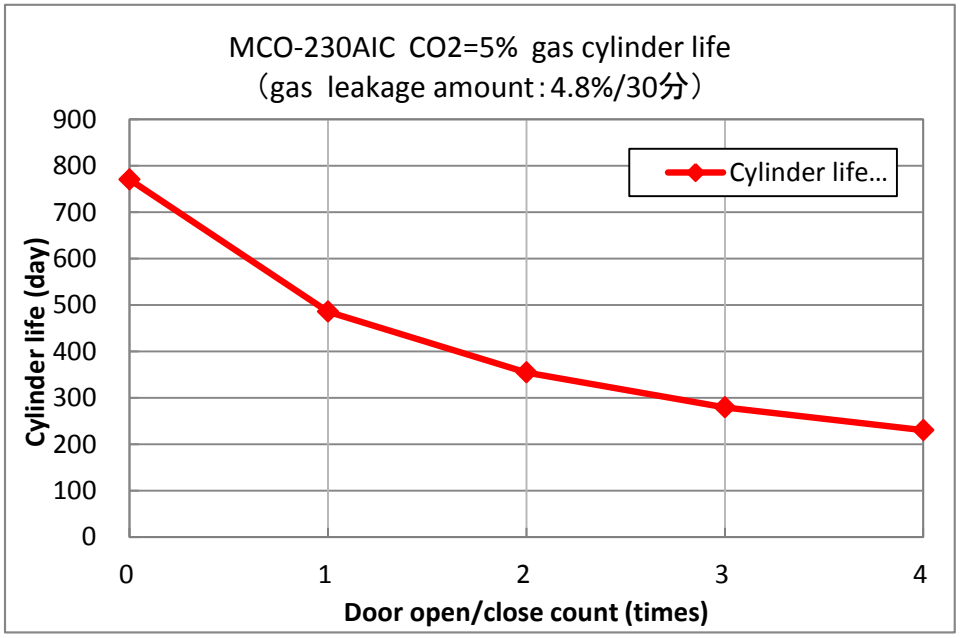


Temperature recovery

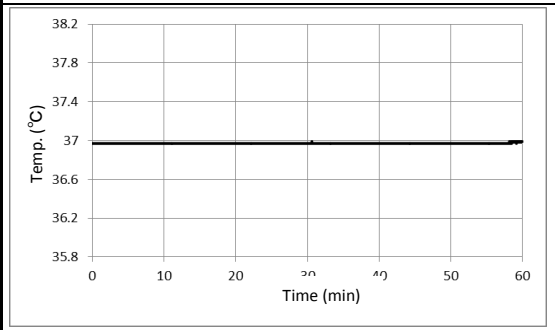
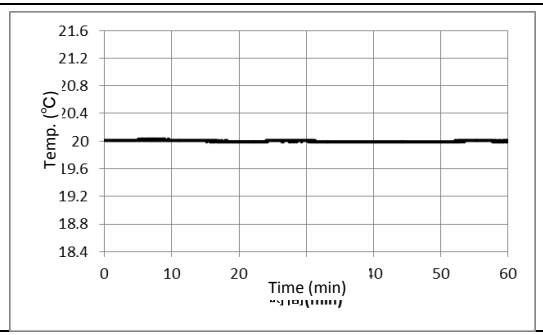
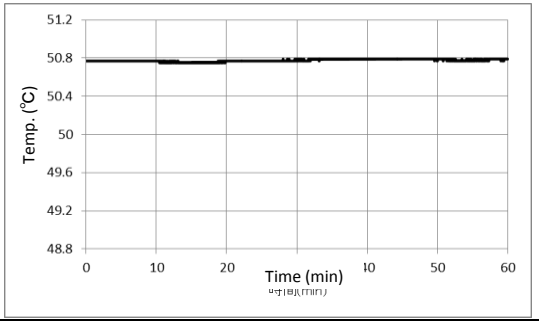


CO_2 density recovery





Temp. distribution

<table>
<tr><th>setting</th><th>SV=37℃</th><th>SV=20℃</th><th>SV=50℃</th></tr>
<tr><td>P1-1: Temp. accurecy</td><td>-0.13℃(AT=23℃:36.97℃、room temp.=23.0℃)</td><td>0.00℃(AT=15℃:20.0℃、room temp.=14.8℃)</td><td>+0.78℃(AT=23℃:50.78℃、room temp.F8=23.2℃)</td></tr>
<tr><td>P1-2: Temp. fluctuation range</td><td>±0.01℃(AT=23℃:36.97～36.99℃、room temp.=23.0℃)</td><td>±0.02(AT=15℃:19.99～20.03℃、room temp.=14.8℃)</td><td>±0.02(AT=23℃:50.75～50.79℃、room temp.=23.1℃)</td></tr>
<tr><td>＊Actual data of P1-1, P1-2
Cycle of 1/2H center air</td><td> 
</td><td> 
</td><td> 
</td></tr>
<tr><td>P1-3: Temp. distribution</td><td>±0.17℃(AT=23℃:36.954～37.290℃、room temp.=23.0℃)</td><td>±0.23(AT=15℃:19.831～20.283℃、room temp.=14.8℃)</td><td>±0.34(AT=23℃:50.543～51.228℃、room temp.=23.2℃)</td></tr>
<tr><td>＊Actual data of P1-3</td><td>AT=23℃ room temp. 23.0℃ CO2:0.0%
Chamber temp .9 points(avg). (Pt 100 Ω)
Upper right front 37.290
Upper right rear 37.073
Upper left front 37.034
Upper left rear 36.971
Center 36.971
Lower right front 36.973
Lower right rear 36.954
Lower left front 36.650
Lower left rear 36.810</td><td>AT=15℃ room temp. 14.8.℃ CO_2:0.0%
Chamber temp .9 points(avg). (Pt 100 Ω)
Upper right front 20.196
Upper right rear 20.153
Upper left front 20.283
Upper left rear 20.116
Center 20.000
Lower right front 20.055
Lower right rear 20.001
Lower left front 19.831
Lower left rear 20.243</td><td>AT=23℃ room temp. 23.2℃ CO_2:0.0%
Chamber temp .9 points(avg). (Pt 100 Ω)
Upper right front 51.228
Upper right rear 50.798
Upper left front 50.573
Upper left rear 50.543
Center 50.775
Lower right front 50.743
Lower right rear 50.653
Lower left front 51.158
Lower left rear 50.626</td></tr>
<tr><td>P1-5: Change of chamber temp. and ambient temp.</td><td>0.18℃
AT=15℃:37.03℃、room temp.=15.15℃
AT=23℃:36.97℃、room temp.＝22.99℃</td><td>-</td><td>0.12℃
AT=15℃:50.66℃、room temp.=15.26℃
AT=23℃:50.78℃、room temp.=23.16℃</td></tr>
<tr><td>P1-15: Condenstaion on inside
inner door and chamber wall</td><td>none(AT=15、23、30℃)</td><td>-</td><td>-</td></tr>
</table>

Instruction

- This section is extracted and printed from Instruction Manual.

- If you find out "Refer to page ● ●" in them, this page means not page in Service manual but page in the lower corner of each page in the extract from Instruction Manual. This page number is not corresponded with serial number in Service manual

- Please note the extracted Instruction Manual which corresponds to the initial unit production, so the contents may be revised in future.

- The products for -PE and -PC have their own instruction manual respectively. For these countries , please refer to the respective instruction manual.

Panasonic®

Operating Instructions

CO_2 Incubator

MCO-230AIC

MCO-230AICUV

MCO-230AICUVH

MCO-230AIC
MCO-230AICUV
MCO-230AICUVH Series

Please read the operating instructions carefully before using this product, and save the operating instructions for future use.

See page 96 for all model numbers.

CONTENTS

CONTENTS

INTRODUCTION

■ Read the operating instructions carefully before using the Product and follow the instructions for safety operation.

■ Our company disavows any responsibility for safety if the Product is used for other than the intended use or used with any procedures other than those given in the operating instructions.

■ Keep the operating instructions in a suitable place so that it can be referred to as necessary.

■ The contents of the operating instructions are subject to change without notice for improvement of performance or functions.

■ Contact our sales representative or agent if any page of the operating instructions is lost or the page order is incorrect.

■ Contact our sales representative or agent if any point in the operating instructions is unclear or if there are any inaccuracies.

⚠CAUTION

Our company guarantees the product under certain warranty conditions. Our company in no way shall be responsible for any loss of content or damage of content.

PRECAUTIONS FOR SAFE OPERATION

It is imperative that the user complies with the operating instructions as it contains important safety advice.

Items and procedures are described so that you can use this unit correctly and safely. If the precautions advised are followed, this will prevent possible injury to the user and any other person.

Precautions are illustrated in the following way:

⚠WARNING

Failure to observe WARNING signs could result in a hazard to personnel possibly resulting in serious injury or death.

⚠CAUTION

Failure to observe CAUTION signs could result in injury to personnel and damage to the unit and associated property.

Symbol shows;

△ This symbol means caution.

⃠ This symbol means an action is prohibited.

● This symbol means an instruction must be followed.

Be sure to keep the operating instructions in a place accessible to users of this unit.

< Label on the unit >

This mark is labeled on the cover in which the electrical components of high voltage are enclosed to prevent the electric shock.
The cover should be removed by a qualified engineer or a service personnel only.

⚠WARNING

As with any equipment that uses CO_2 gas, there is a likelihood of oxygen depletion in the vicinity of the equipment. It is important that you assess the work site to ensure there is suitable and sufficient ventilation. If restricted ventilation is suspected, then other methods of ensuring a safe environment must be considered. These may include atmosphere monitoring and warning devices.

USA Only (Model with a lamp): This product has a lamp that contains mercury. Disposal may be regulated in your community due to environmental considerations. For disposal or recycling information, please visit Panasonic website: http://www.panasonic.com/environmental or call 1-888-769-0149.

For the State of California, USA Only:
This product contains a CR Coin Cell Lithium Battery which contains Perchlorate Material – special handling may apply. See www.dtsc.ca.gov/hazardouswaste/perchlorate.

⚠WARNING

Do not use the unit outdoors. Current leakage or electric shock may result if the unit is exposed to rain water.

Only qualified engineers or service personnel should install the unit. The installation by unqualified personnel may cause electric shock or fire.

Install the unit on a sturdy floor and take an adequate precaution to prevent the unit from turning over. If the floor is not strong enough or the installation site is not adequate, this may result in injury from the unit falling or tipping over.

Never install the unit in a humid place or a place where it is likely to be splashed by water. Deterioration of the insulation may result which could cause current leakage or electric shock.

Never install the unit in a flammable or volatile location. This may cause explosion or fire.

Never install the unit where acid or corrosive gases are present as current leakage or electric shock may result due to corrosion.

Always ground (earth) the unit to prevent electric shock. If the power supply outlet is not grounded, it will be necessary to install a ground by qualified engineers.

Never ground the unit through a gas pipe, water main, telephone line or lightning rod. Such grounding may cause electric shock in the case of an incomplete circuit.

Connect the unit to a power source as indicated on the rating label attached to the unit. Use of any other voltage or frequency other than that on the rating label may cause fire or electric shock.

Never store volatile or flammable substances in this unit if the container cannot be sealed. These may cause explosion or fire.

Do not insert metal objects such as a pin or a wire into any vent, gap or any outlet on the unit. This may cause electric shock or injury by accidental contact with moving parts.

Use this unit in safe area when treating the poison, harmful or radiate articles. Improper use may cause bad effect on your health or environment.

Turn off the power switch (if provided) and disconnect the power supply to the unit prior to any repair or maintenance of the unit in order to prevent electric shock or injury.

Do not touch any electrical parts (such as power supply plug) or operate switches with a wet hand. This may cause electric shock.

PRECAUTIONS FOR SAFE OPERATION

⚠WARNING

Ensure you do not inhale or consume medication or aerosols from around the unit at the time of maintenance. These may be harmful to your health.

Never splash water directly onto the unit as this may cause electric shock or short circuit.

Never put containers with liquid on the unit as this may cause electric shock or short circuit when the liquid is spilled.

Never bind, process, or step on the power supply cord, or never damage or break the power supply plug. A broken supply cord or plug may cause fire or electric shock.

Do not use the supply cord if its plug is loose. Such supply cord may cause fire or electric shock.

Never disassemble, repair, or modify the unit yourself. Any such work carried out by an unauthorized person may result in fire, or electric shock or injury due to a malfunction.

Disconnect the power supply plug if there is something wrong with the unit. Continued abnormal operation may cause electric shock or fire.

When removing the plug from the power supply outlet, grip the power supply plug, not the cord. Pulling the cord may result in electric shock or fire by short circuit.

Disconnect the power supply plug before moving the unit. Take care not to damage the power cord. A damaged cord may cause electric shock or fire.

Disconnect the power plug when the unit is not used for long periods. Keeping the connection may cause electric shock, current leakage, or fire due to the deterioration of insulation.

If the unit is to be stored unused in an unsupervised area for an extended period, **ensure that children do not have access and that doors cannot be closed completely.**

The disposal of the unit should be accomplished by appropriate personnel. Remove doors to prevent accidents such as suffocation.

Do not put the packing plastic bag within reach of children as suffocation may result.

Use the reagent specified by our company for H_2O_2 decontamination. Using a different H_2O_2 solution may result in explosion or damage to the incubator.

When performing H_2O_2 decontamination, **securely close the internal and external doors**. Failure to do so may be harmful to health due to leakage of H_2O_2 gas.

During H_2O_2 decontamination**, plug the access hole with the silicon cap that is provided.** Failure to do so may be harmful to health due to leakage of H_2O_2 gas.

Always use the removal power supply cord that is provided. Other power supply cord may cause electric shock or fire.

⚠CAUTION

- This unit must be plugged into a dedicated circuit protected by branch circuit breaker.
- Use a dedicated power source as indicated on the rating label attached to the unit. A multiple-tap may cause fire resulting from abnormal heating.
- **Never store corrosive substances such as acid or alkali** in this unit if the container cannot be sealed. These may cause corrosion of inner components or electric parts.
- **Check the setting when starting up of operation after power failure or turning off of power switch.** The stored items may be damaged due to the change of setting.
- **Be careful not to tip over the unit** during movement to prevent damage or injury.
- **Prepare a safety check sheet** (copy the last page) when you request any repair or maintenance for the safety of service personnel.
- **Wear rubber gloves when handling the H_2O_2 reagent**. Direct contact with the H_2O_2 reagent may result in inflammation of the skin.
- H_2O_2 decontamination can be performed only for the chamber and chamber attachments with standard specifications, and not for any other objects.
- **Perform H_2O_2 decontamination with the chamber attachments arranged as specified by our company.** Arranging them in a different way may result in insufficient decontamination.
- After H_2O_2 decontamination has been completed, **wear rubber gloves and use a non-woven cloth to wipe off the residual H_2O_2 fluid from the bottom of the chamber, any objects that were decontaminated, and the bottoms of ducts.**

LABELS ON INCUBATOR

Warning and caution labels are attached to the incubator. The following table describes the labels.

	This label is attached to covers that access high-voltage electrical components to prevent electric shock. Only a qualified engineer or service personnel should be allowed to open these covers.
	This symbol indicates an ultraviolet light (UV) caution.
	This symbol indicates that caution is required. Refer to product documentation for details.
	This symbol indicates a hot surface.
	This symbol indicates an earth.
	This symbol means “ON” for a power switch.
	This symbol means “OFF” for a power switch.

ENVIRONMENTAL CONDITIONS

This equipment is designed to be safe at least under the following conditions (based on the IEC-61010-1):

■ Indoor use;

■ Altitude up to 2000 m;

■ Temperature 5^{o}C to 40^{o}C

■ Maximum relative humidity 80% for temperature up to 31^{o}C decreasing linearly to 50% relative humidity at 40^{o}C;

■ Mains supply voltage fluctuations up to ±10% of the nominal voltage;

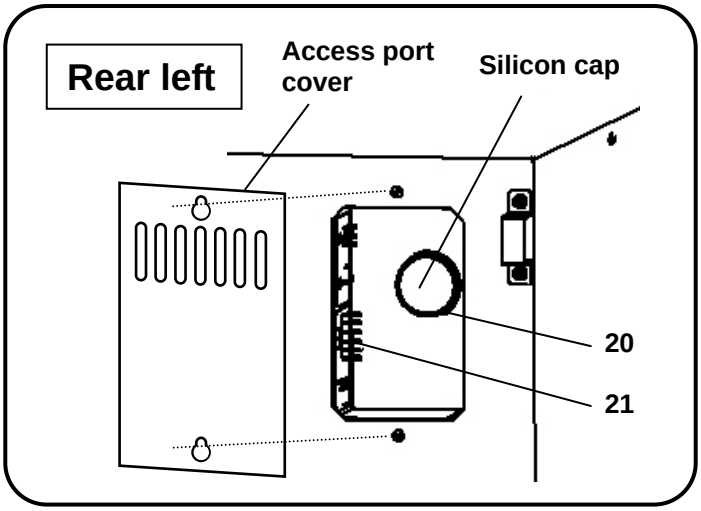
■ Transient overvoltages up to the levels of OVERVOLTAGE CATEGORY Ⅱ;

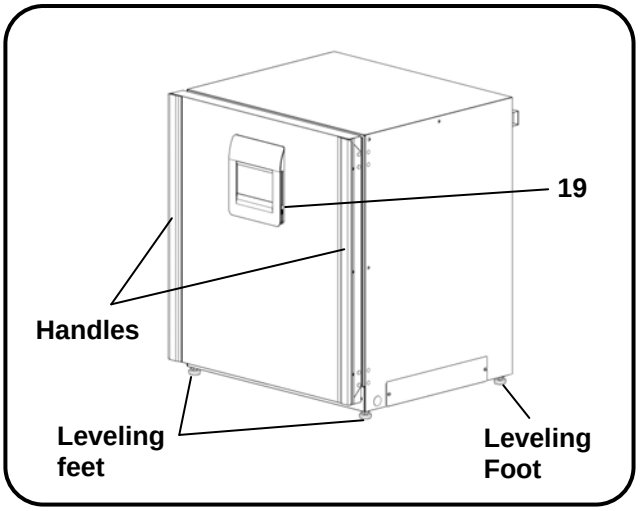
■ Temporary OVERVOLTAGES occurring on the mains supply;

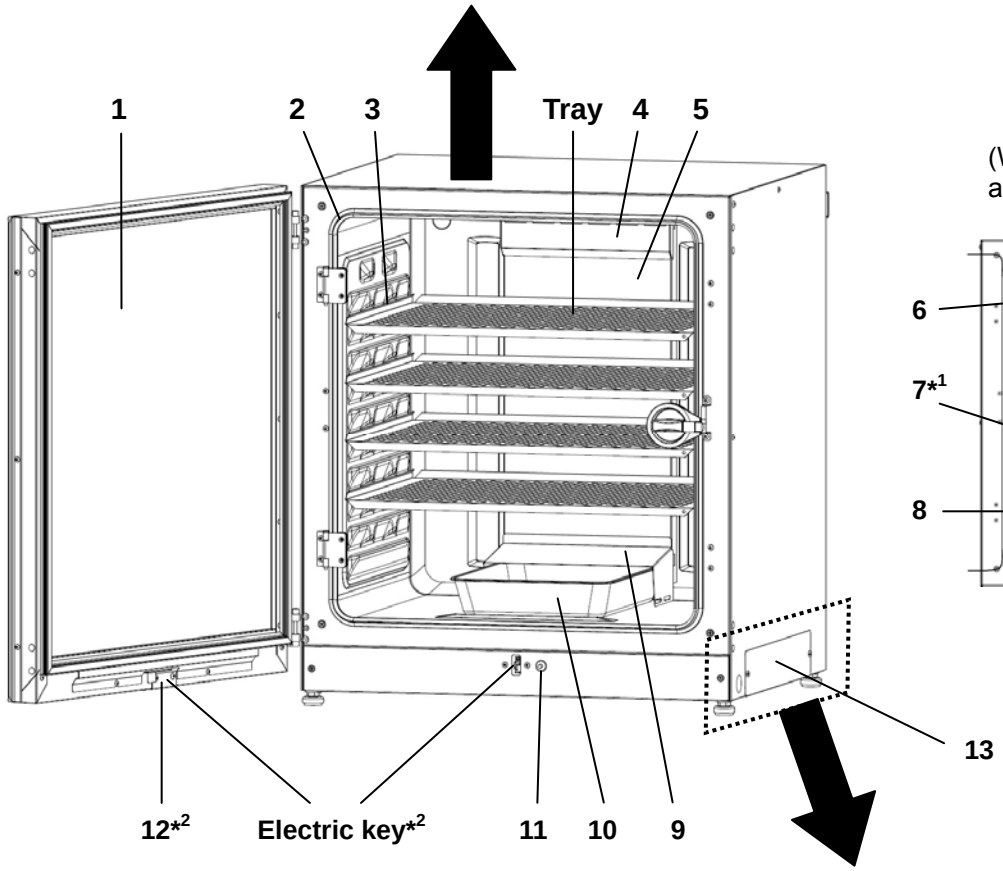
■ Applicable pollution degree of the intended environment (POLLUTION DEGREE 2 in most cases);

INCUBATOR COMPONENTS

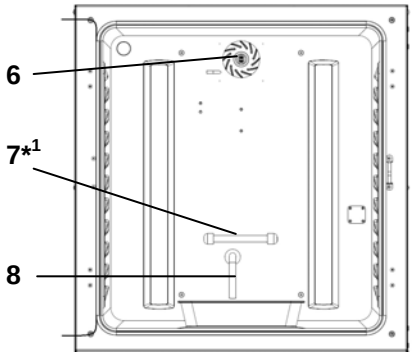
Unit



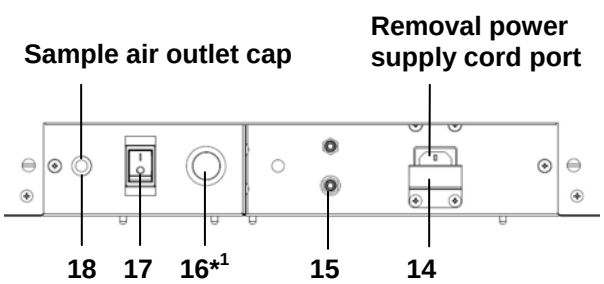




(When some inner attachments are removed)



Lower right side (When **13** is removed)



1: MCO-230AICUVH/230AICUV or when an optional UV system set MCO-170UVS is installed.
2: MCO-230AICUVH or when an optional electric lock MCO-170EL is installed.

1. Outer door: The outer door is held to the frame with the magnetic seal. The door heater is installed in the door panel. The door opening is reversible. Contact our sales representative or agent to change the door hinge from left to right or vice versa.

2. Inner door: The inner door is made of tempered glass. However do not subject the glass to excessive impacts.

3. Tray catches: Insert tray to fit the concave portion on chamber.

4. Fan cover: The fan cover serves as the inlet for circulating air. It is removable.

5. Duct: The duct for the path for circulating air. It is removable.

6. Fan (inside the duct): The fan is made from polypropylene resin. It can be disinfected in an autoclave.

7. UV lamp*[1]: This UV lamp does not generate ozone. Never look directly at the UV light. Refer to page 57 ～61 for using. For replacement, contact our sales representative or agent.

8. Humidity control bar: Reduce automatically dew condensation occurred by the effect of outside environment and the frequency of door opening/closing.
The humidity control bar has bactericidal effects by plated surface of it. However, it is recommended to replace the humidity control bar every 5 to 6 years to maintain bactericidal effects. (The duration of bactericidal effects differs depending on the use environment.)

9. Humidifying pan cover: This cover prevents the UV light entering the chamber. Always use it. Using without it may have a bad influence on the chamber temperature distribution and humidity recovery.

10. Humidifying pan: Fill the humidifying pan with sterile distilled water, and set the humidifying pan with the inner side flush against the back. Install the humidifying pan in a longitudinal direction as its shorter side is placed in the back.

11. Door switch: Detects the door opening/closing and stops the fan and electromagnetic valve for CO_2 when the door is open. The UV lamp*[1] is also deactivated by the door opening.

12. Key hole*[2]: This is the hole to unlock with unlock key while outer door is locked by electric lock.

13. Switch cover: Prevent the accident of gas tube disconnected by the unexpected touch or power off.

14. Power supply cord cover plate: This plate is to prevent the power cord being come off.

15. Connecting port A for CO_2 gas pipe: Refer to page 20 for gas cylinder connection. Ensure that the gas pressure is set at 0.03 MPa(G) (0.3 kgf/cm^2(G), 4.3 psi(G)).
Note: When the optional MCO-21GC gas auto changer is installed, both ports A and B are available. Refer to page 75 for gas auto changer.

16. Glow starter*[1]: The glow is started for the UV lamp.

17. Power switch: This is the main switch for the incubator. It also functions as an overcurrent breaker.

18. Sample air outlet: The sample air outlet also functions as an internal gas outlet. Normally, cover this outlet with the sample air outlet cap.

19. USB port: Insert USB memory to export operations and alarms log. Refer to page 41～52.
Note: It is impossible to use USB memory which is required password input.

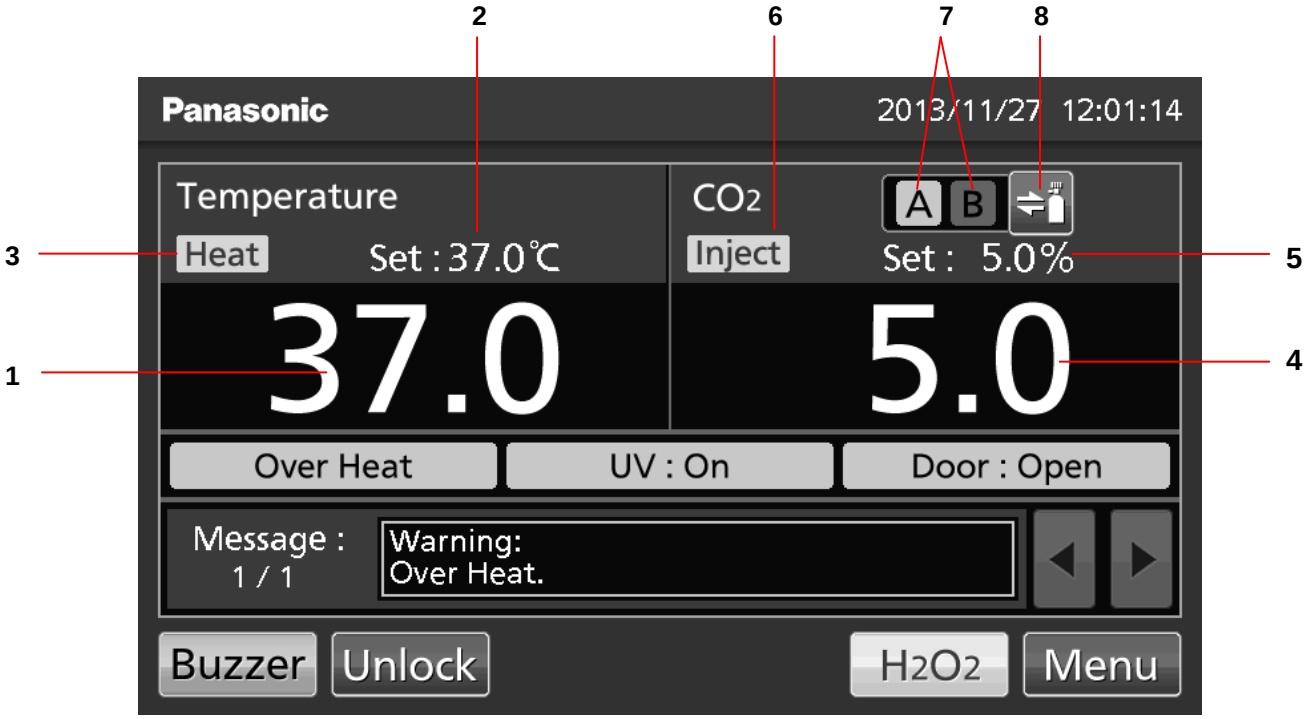
20. Access port: Place the silicon caps on both outside and inside of the port when the port is not being used.

21. Remote alarm terminals: This terminal informs the alarm to remote location by connecting to external alarm unit. Refer to page 14.

INCUBATOR COMPONENTS

LCD touch panel

The following display (called the Top screen) will appear when the power switch is turned ON.
Note: It takes approximately 20 seconds until Top screen is displayed. During warming-up, "Status: Gas sensor initializing" is displayed in the Message display field (**13**), and "--.-" is displayed in the Present CO_2 density display field (**4**).



1. Present temperature display field
The current chamber temperature is displayed.

2. Set temperature value display field
The set value of chamber temperature is displayed. Default setting: 37 °C.

3. Heating indicator
This lamp lights when the heater is energized.

4. Present CO_2 density display field
The current chamber CO_2 density is displayed. Nothing is displayed when CO_2 density is set 0 %.

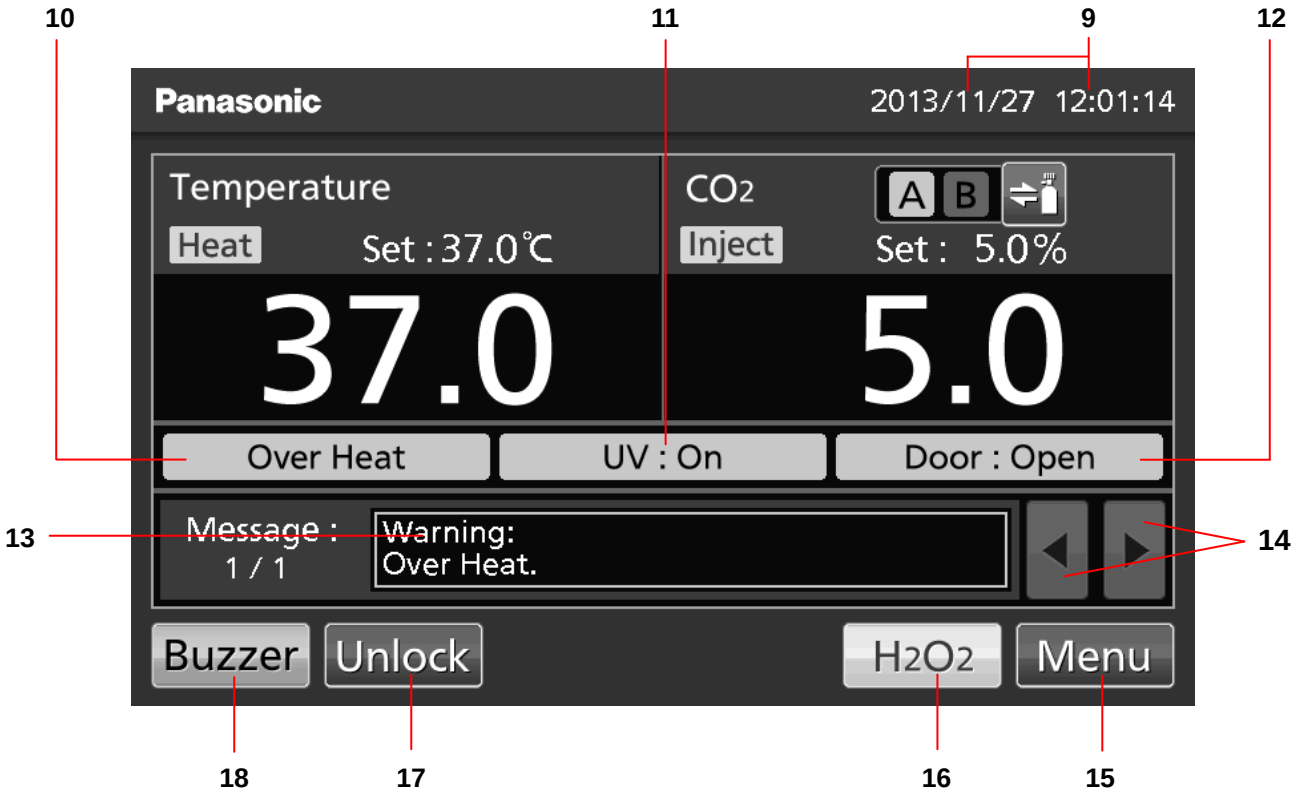
5. Set CO_2 density value display field
The set value of the chamber CO_2 density is displayed. Default setting: 0 %.

6. CO_2 gas injection indicator
This lamp lights when CO_2 gas is being injected.

7. CO_2 gas supply line indicator A and B*[1]
Current supplying CO_2 gas supply line (connecting port for CO_2 gas pipe) is displayed. The connecting port A/B for gas pipe that is currently supplying CO_2 is displayed in reverse video and blinks.

8. CO_2 gas supply line select key*[1]
This is a key to select CO_2 gas supply line A or B (Connecting port A or B for CO_2 gas pipe). When an optional gas auto charger MCO-21GC is installed, CO_2 gas supply line A/B changes over automatically when CO_2 gas cylinder is empty. Changeover is also workable by pressing this key.

*1: Only when an optional component MCO-21GC (Gas auto charger) is installed, this key is workable. They are not displayed when the MCO-21GC is not installed.



9. Present date/time display field
Normally, this indicator shows date and time. The date and time is simply set when the incubator is shipped from the factory. Refer to page 53 for details.

10. Over heat display
High limit temperature alarm is activated:
"Over Heat" is displayed alternately in normal characters and reverse video.

11. UV lamp condition display
UV lamp ON: "UV : On" is displayed.
UV lamp OFF: "UV : Off" is displayed.
Note: Nothing is displayed when an optional UV system set MCO-170UVS is not installed to the MCO-230AIC.

12. Outer door (opening/closing) display
Open: "Door : Open" is displayed alternately in normal characters and reverse video.
Close: "Door : Closed" is displayed.
Locked: "Door : Locked" is displayed.*2

13. Message display field
Alarms, errors or messages are displayed when fault occurs. Refer to page 83～85.
Note: When there are a number of alarms/errors, the display shows the message. For example, if 2 alarms/errors occur in total, the display shows "1/2".

14. Message select key
When there are a number of alarm/errors, the message on the screen is changeable.

15. Menu key
Press this key to lead the Menu screen. It is possible to set various setting on the Menu screen. Refer to page 29.

*2: Auto lock function by electric lock is workable under any of the following conditions. When the condition is not fulfilled, "Door : Locked" or Unlock key are not displayed.
・MCO-230AICUVH ・When an optional electric lock MCO-170EL is installed.

16. H_2O_2 key*[3]
This key is to run H_2O_2 decontamination. Refer to page 62 to 67.

17. Unlock key*[2]
Press this key is to unlock the outer door when it is auto-locked by electric lock. Refer to page 72. When the auto lock function is OFF, this key is not displayed.

18. Buzzer key
Press this key to silence the buzzer. However, when the ring back is ON, the buzzer will sound again when the ring back passed and the alarm state still continues. Refer to page 39～40 and 83～85.
Note: It is not possible to silence the buzzer for the high limit temperature alarm.

*3: The H_2O_2 decontamination function is workable under any of the following conditions. When the condition is not fulfilled, the H_2O_2 key is not displayed on the LCD touch panel.
・When an H_2O_2 generator MCO-HP is installed in the MCO-230AICUVH.
・When all H_2O_2 generator MCO-HP, H_2O_2 decon board MCO-170HB and electric lock MCO-170EL are installed in the MCO-230AICUV.
・When all UV system set MCO-170UVS, H_2O_2 generator MCO-HP, H_2O_2 decon board MCO-170HB and electric lock MCO-170EL are installed in the MCO-230AIC.

Remote alarm terminal

The alarm of this product can be informed at a remote location from this product by connecting the external alarm unit to the remote alarm terminals. For the type and behavior of remote alarm output, refer to page 83 to 85.

The terminal of the remote alarm is installed at the rear upper right of the unit (See the figure on the point). The alarm is outputted from this terminal. Contact capacity is DC 30 V, 2 A.
When Buzzer key is pressed, the behavior of the remote alarm is showed in Table.1.
Note: In the door alarm, the remote alarm does not work. Refer to page 83 to 85.

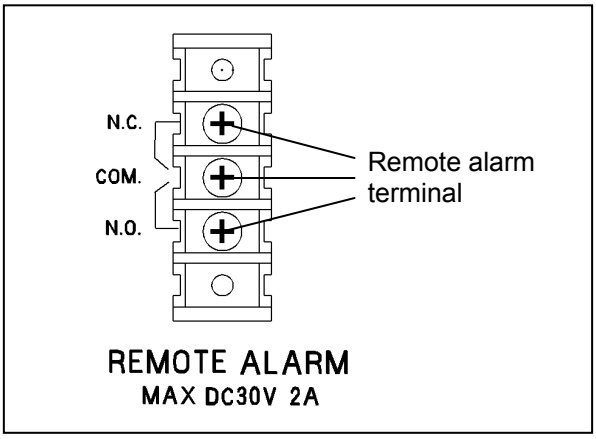


Table 1 The behavior of the remote alarm when pressing the Buzzer key

Remote Alarm setting (Refer to page 38～40)	Connecting terminal	Normal condition	Abnormal condition (Including in the cases of power outage and of where the power plug is pulled out.)	
				When pressing the buzzer key
ON: Non-interlock with Buzzer key	COM.-N.C.	Close	Open	Open (Maintain in abnormality)*
	COM.-N.O.	Open	Close	Close (Maintain in abnormality)*
OFF: Interlock with Buzzer key	COM.-N.C.	Close	Open	Close (Return to normal)
	COM.-N.O.	Open	Close	Open (Return to normal)

*In case of Err01 (CO_2 gas cylinder empty), Err11, 12(CO_2 sensor error), the condition returns to normal.

INSTALLATION

Installation site

For correct operation of the incubator, install it in a location with the following conditions.

⚠WARNING

When using CO_2 gas for control, **make sure that there is an adequate ventilation**. Using CO_2 gas in a small room without adequate ventilation may cause gas poisoning or oxygen deprivation. In addition, when opening the incubator doors, do not directly inhale the air in the chamber.

Si l'appareil est utilisé dans un evdroit restreint, le niveau de la densite CO_2 de l'air peut s'élever et peut être nocif aux humains. Evitez d'aspirer l'air provenant de l'inérieur de l'appareil quand vous ouverz la porte.

● **Normal air environment**
Install the incubator in an environment with normal air.

● **Do not expose to direct sunlight**
Do not install the incubator in a location where it will be exposed to direct sunlight. If the incubator is operated in direct sunlight, performance will be adversely affected.

● **Separate from heat sources**
Do not install the incubator near significant heat sources, such as heaters, boilers, ovens, or autoclaves. Heat will adversely affect the performance of the incubator.

● **Ambient temperature at least 5 °C lower than set temperature**
The control temperature of the incubator is at least 5 °C higher than the ambient temperature. For example, if the chamber is controlled at 37 °C, the ambient temperature must be 32 °C or less. Do not allow the ambient temperature to become too high.

● **Strong and level floor**
Select a site with a strong and level floor. If the floor is uneven or the installation is not level, the incubator will be unstable and this may cause accident or injury. To avoid vibration and noise, always make sure that the installation is stable. An unstable surface may result in vibration or noise.

⚠WARNING

Install the incubator at a location that can support the weight. If the floor is not strong enough or if the installation is insufficient, the incubator may fall over and cause injury.

Always make sure that the floor is strong, even, and level, and that the incubator will not tip over. An insufficient installation may result in injury due to water leakage or the incubator falling over.

● **Separate from vibration products**
Do not install the incubator near vibration products. Vibration may cause culture failure.

● **Low humidity**

Select a site with a relative humidity of 80 %R.H. or lower. Using the incubator in high humidity may result in current leakage or electric shock.

⚠WARNING

Do not use the incubator outdoors. If the incubator is exposed to rain water, it may result in current leakage or electric shock.

Never install the incubator in a moist location, such as near a sink or water line, or where it is likely to be exposed to water. In addition, **do not install it near water or steam pipes**. Moisture can cause the insulation to deteriorate, which may result in current leakage or electric shock.

● **No inflammable or corrosive gas**

Never install the incubator in a location where it will be exposed to inflammable or corrosive gas. Doing so may result in explosion or fire. In addition, insulation may deteriorate due to corrosion of protective casing, resulting in current leakage or electric shock.

● **No falling objects**

Do not install the incubator in a location where there is the possibility of objects falling from above. Doing so may result in damage or accident.

Installation

1. Remove the packing tape and clean up.

Remove all the tapes that are securing the doors and the inner attachments. Open the doors for ventilation. If the outer panels are dirty, wet a cloth with a diluted neutral detergent and wipe them. (Undiluted detergent can damage the plastic components. For the dilution, refer to the instruction of the detergent.) Wipe off the residual detergent with a wet cloth and then wipe off any moisture.

Note: Remove the cable tie banding the power supply cord. Prolonged banding may cause the corrosion of the cord coating.

⚠WARNING

Do not leave the plastic wrapping bags within reach of children. If the bag is placed over a child's head, it can block the mouth and nose and cause suffocation.

2. Set the humidifying pan and humidifying pan cover (Fig. 1).

3. Set 4 trays (Fig. 2).

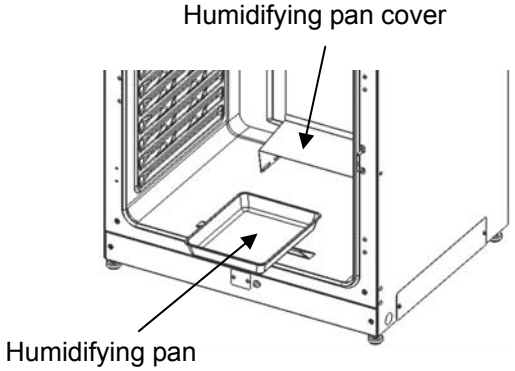


Fig. 1

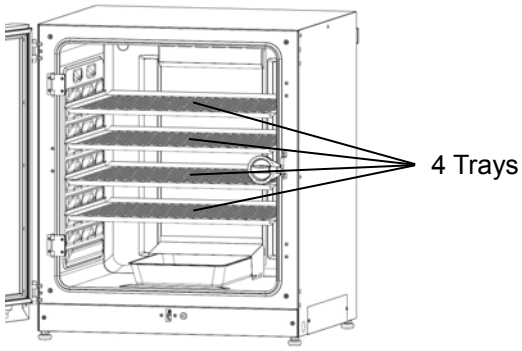


Fig. 2

4. Adjust the leveling feet.

Adjust the leveling feet by turning them counterclockwise to level the incubator (Fig. 3).

Note: Incubating on a leaning tray may have a bad influence on the cultivation.

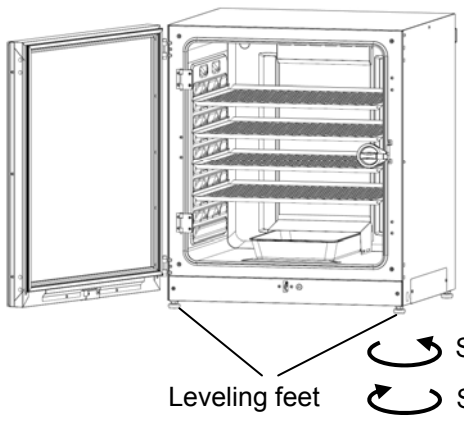


Fig. 3

5. Ground the incubator.

Ground the incubator during installation to prevent electric shock in case the insulation is not sufficient. If there is no ground wire at the location, consult with qualified service personnel.

● **When a ground must be installed**

If a grounded 3-pole outlet is not available, then a ground must be installed. Consult with qualified service personnel.

⚠WARNING

To prevent electric shock, **always ground the incubator.** If grounding is not possible, then have a ground installed by qualified personnel. If the incubator is not grounded, it may result in electric shock.

Never connect the ground wire to a gas pipe, water pipe, lightning rod, or telephone ground wire. Doing so may cause electric shock.

● **Installing a ground fault circuit breaker**

If using the incubator in the location with moisture or humidity cannot be avoided, then it is recommended that a ground fault circuit breaker be installed in the power supply circuit (i.e., the power supply at the incubator). Have the circuit breaker installed by qualified service personnel.

⚠CAUTION

Do not climb on the incubator or place objects on top of it. Doing so may damage it or cause it to fall over, resulting in injury.

● **In case of double stack**

For stacking the incubators surely, refer to the procedure included with the optional double stacking bracket MCO-170PS or the stacking plate MCO-230SB.

Note: Two hooks are attached to the rear of the upper incubator. When stacking incubators, fix the upper incubator to the wall with these hooks and wire or chain (Fig. 4).

Note: When stacking the incubators on our CO_2 incubator or O_2/CO_2 incubator other than this product, use the stacking plate MCO-230SB. Refer to table 11 on page 96.

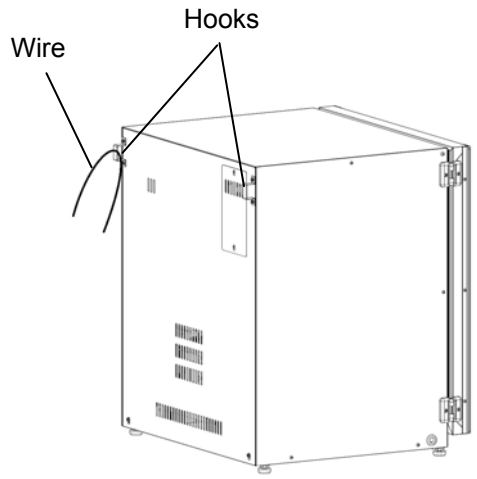


Fig. 4

● **When the incubator is not in use**

Empty the water from the humidifying pan and remove moisture from the chamber. Make sure that the chamber is completely dry before closing the doors. Failure to do so may result in damage.

● **Before moving the incubator**

Before moving the incubator, empty the water from the humidifying pan, disconnect the power supply plug from the outlet, and make sure that the cord will not be damaged. Failure to do so may result in electric shock or fire.

INSTALLATION

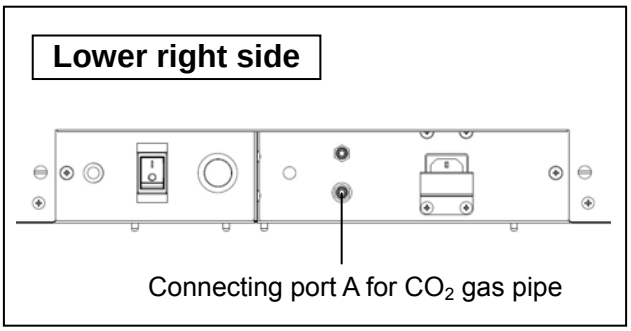
Connecting CO_2 gas cylinder

⚠WARNING

When connecting a gas cylinder to the incubator, **confirm the gas type**. **Confirm that the connections are secure and that no gas will leak**. **Be sure to use the specified pressure**. Using an incorrect gas or pressure may result in explosion or fire, or in gas poisoning or oxygen deprivation due to qas leak.
Install the incubator in a location with adequate ventilation. If adequate ventilation cannot be provided, then install an alarm system using CO_2 and O_2 densitometers.

1. Get a CO_2 gas cylinder ready and install an optional gas regulator MCO-100L.
Note:
・Use a liquefied CO_2 gas cylinder (at least 99.5 % pure). The siphon (dip tube) type cannot be used.
・When MCO-100L is not available, install a gas regulator rated at 25 MPa(G) (250 kgf/cm^2(G), 3600 psi(G)) for the primary side, and 0.2 MPa(G) (2 kgf/cm^2(G), 30 psi(G)) for the secondary side.

2. Using a gas tube that is provided, connect the connecting port A for CO_2 gas pipe and the gas regulator of the CO_2 gas cylinder.
For details on installing the optional automatic CO_2 cylinder changeover kit (MCO-21GC), refer to page 75～77.



Note:
・By using 2 tube bands that is provided, connect the gas tube tightly to prevent it from coming off.
・Make sure that the gas tube is not folded.
・If the CO_2 gas is supplied to multiple CO_2 incubators from a single gas cylinder, a CO_2 solid will be formed in the gas regulator. The gas regulator safety valve will operate, and there may an explosive sound.

3. After connecting the gas tube, make sure that no gas is leaking (ex. by using a gas leak detection spray).

4. Set the CO_2 gas on the secondary side to 0.03 MPa(G) (0.3 kgf/cm^2(G), 4.3 psi(G)) for gas injection.
Note: As the pressure increases, the CO_2 gas density control range will increase. Excessive pressure may cause gas supply lines inside the incubator to come loose, which may result in gas poisoning or oxygen deprivation due to gas leak. If gas lines come loose, the incubator must be repaired.

5. When there is no CO_2 gas left and the CO_2 gas empty alarm is activated, replace the empty gas cylinder to a new one.
Note: When an optional gas auto changer MCO-21GC is installed, it switches the empty CO_2 gas supply line to the other automatically. Refer to page 75～77.

Note: The gas lines connected to the incubator will degrade over time. If any deterioration or abnormalities are found during inspection, replace the lines immediately.

BEFORE COMMENCING OPERATION

Initial cleaning method

Before using the incubator for the first time, clean dirt (tape residue, smear, etc.) from the chamber and the inner attachments thoroughly. To keep the chamber clean is essential to get the proper performance out of the incubator. Use the following steps to clean the incubator properly.

1. Remove the inner attachments, referring to “Removing inner attachments” on page 22.

2. Clean the removed inner attachments, the chamber inside walls and the inner door gaskets with a cloth or sponge soaked in neutral detergent, diluted by 5 % or less. (Undiluted detergent can damage the plastic components. For the dilution, refer to the instruction of the detergent.) (Fig. 1)

⚠CAUTION

Do not use detergents or antiseptic solutions with acid, alkali, or chlorine. Doing so may cause discoloration, corrosion, or rusting.

Be careful to keep the diluted detergent or water out of the temperature sensor, the CO_2 gas injection port, the inner sample air access port, the fan motor shaft bearing, and the inner sample air outlet (Fig.2 ⬅). Also, do not wash the temperature sensor and the UV lamp using detergent. Doing so may cause failure. (Fig. 2)

3. Soak a gauze or unwoven cloth in distilled water and wring it tightly, and then wipe off the residual detergent thoroughly.

4. Wash the silicon caps (2 pcs) for the access port and the fan using the above mentioned detergent and rinse them with distilled water, and then autoclave them for sterilization (121 ^{o}C, 20 minutes).

5. Wipe up the inside walls and the inner attachments like trays thoroughly with a cloth or unwoven cloth soaked in alcohol for disinfection. Be careful not to leave any residue alcohol.

6. Reinstall the inner attachments correctly and securely, referring to “Installing inner attachments” on page 24.

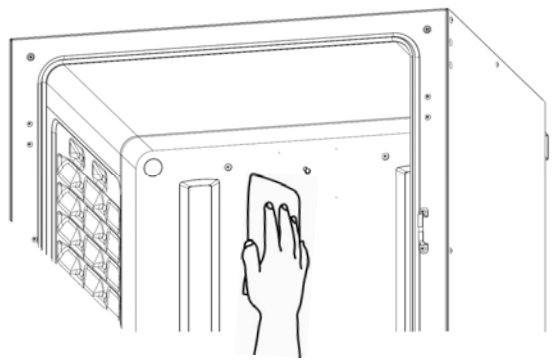


Fig. 1

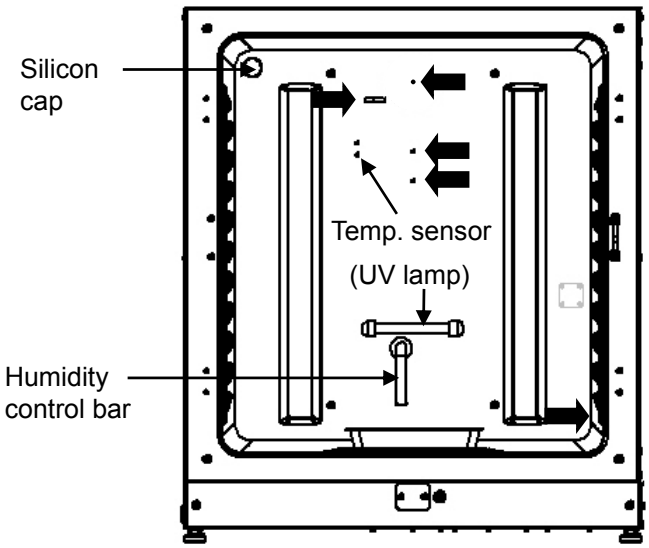


Fig. 2

Removing inner attachments

⚠CAUTION

Wear rubber gloves when performing maintenance on the chamber. Failure to wear gloves may result in cuts or abrasions from sharp edges or corners.

Be careful not to damage the UV lamp in the duct (MCO-230AICUVH/230AICUV or when an optional UV system set MCO-170UVS is installed).

1. Turn OFF the power to the incubator.

2. Open the outer and inner doors and pull out all the trays (Fig. 1).

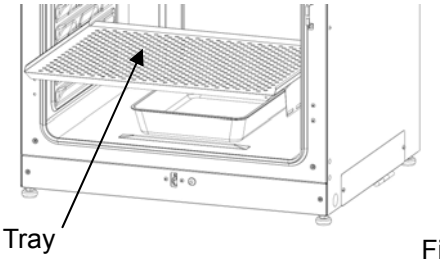


Fig. 1

3. Pull out the humidifying pan (Fig. 2).

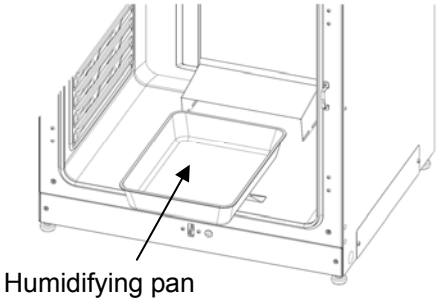


Fig. 2

4. Pull out the humidifying pan cover (Fig. 3).

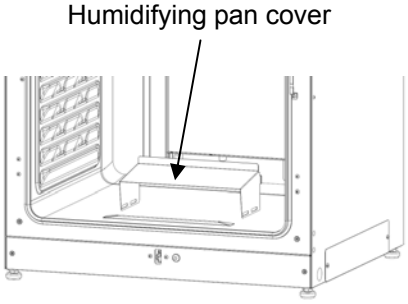


Fig. 3

5. Pull out the fan cover (Fig. 4).

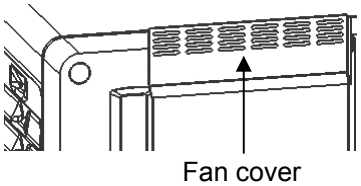


Fig. 4

6. Lift the duct and remove it from the pins on the rear side (Fig. 5).

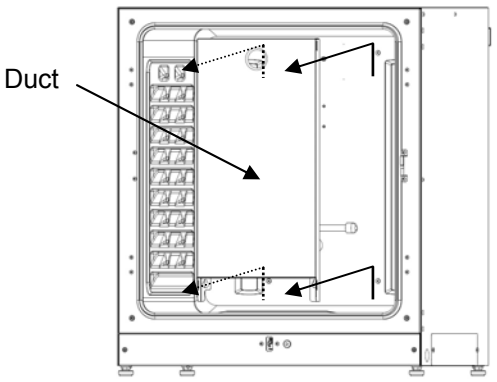


Fig. 5

7. Pull out the fan (Fig. 6).

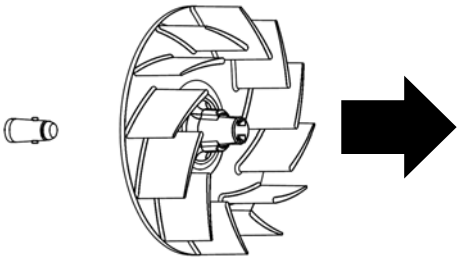


Fig. 6

8. Remove the silicon caps of each access port from interior (Fig. 7) and exterior (Fig. 8).

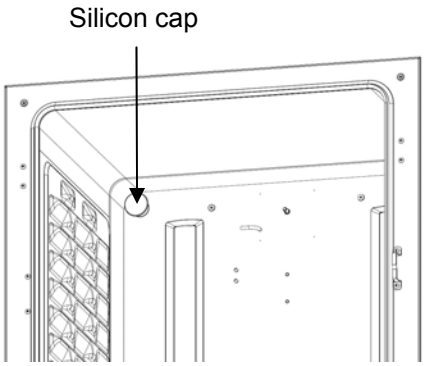


Fig. 7

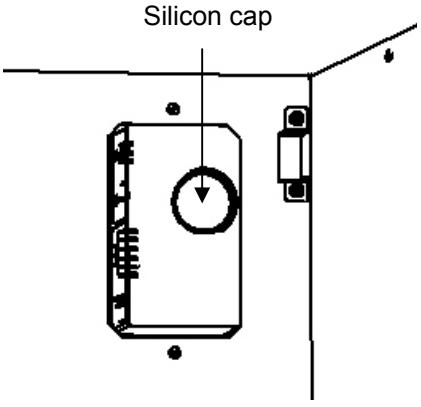


Fig. 8

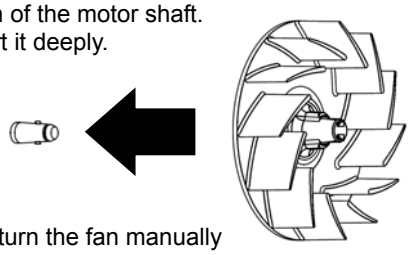
Installing inner attachments

To re-install all the attachments, perform the procedure in reverse order from step 8 on page 23.

Note: When installing the fan, insert it to the motor shaft securely. Lightly turn and pull the fan manually to make sure that it does not touch the rear panel and is installed securely (Fig. 1).

⚠CAUTION
If the fan is not inserted deep enough, the intended velocity performance cannot be achieved, and it may cause culture failure or insufficient decontamination.

①Position the center hole of the fan with the projection of the motor shaft.
And insert it deeply.



②Lightly turn the fan manually
to make sure that it does not touch the rear panel.

③Lightly pull the fan manually to make sure that it is installed.

Fig. 1

Note: To install the duct, confirm 4 pins are securely installed in the 4 holes of the duct. (Fig. 2)

⚠CAUTION
If the duct is fixed insecurely, the intended velocity performance cannot be achieved, which may cause culture failure or insufficient decontamination.

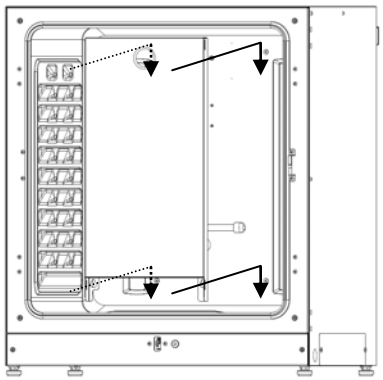
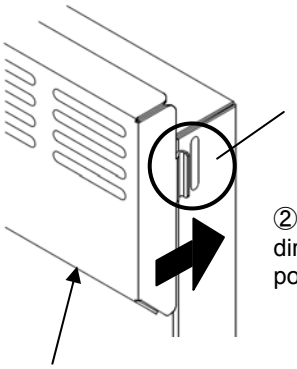


Fig. 2

Note: When installing the fan cover, position the long hole of duct with the projection of fan cover and insert directly (Fig. 3). Same applies for the humidifying pan cover.
The fan cover may lean by strongly pushing the head of it in the back. Make sure that there is no space in the lower fan cover after installing because the leaning fan cover may have a bad influence on the camber temperature distribution.

⚠CAUTION
If the fan cover is fixed insecurely, the intended velocity performance cannot be achieved, which may cause culture failure.



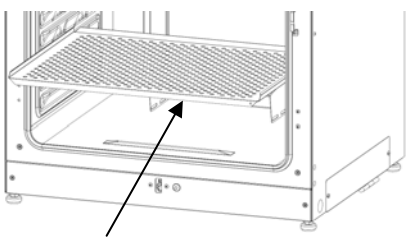
①Position
and insert.

②Confirm the
direction of fixing
position as shown.

③Make sure that there is no space in the lower of fan cover.

Fig. 3

Note: Set the tray with only the front edge bent down (Fig. 4).



Bent down

Fig. 4

Filling humidifying pan

Use the following procedure to fill the humidifying pan with water or to replace water in the humidifying pan.

1. Pull out the humidifying pan toward you. (Fig. 1)

2. Dispose of the remaining water in the humidifying pan and clean the humidifying pan with a diluted detergent. Then rinse it thoroughly with distilled water and wipe it with alcohol for disinfection.

3. Wipe all moisture from the bottom of the chamber.

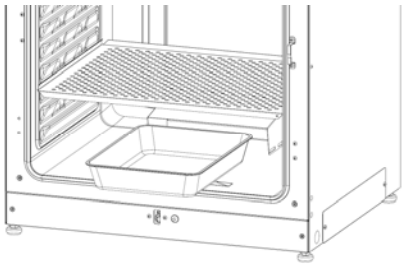


Fig. 1

4. Return the humidifying pan to the chamber and pour sterile distilled water (approx. 1.5 L, preheated to 37 °C). (Fig. 2)

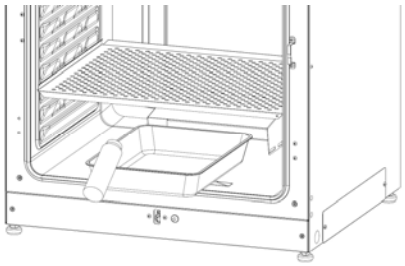


Fig. 2

Note:

・Operation with no humidifying water may increase the chamber temperature than the set temperature temporarily.

・Preheat the water to 37 °C to be poured into the humidifying pan. Adding low-temperature water will lower the temperature and humidity in the chamber.

・Install the humidifying pan in a longitudinal direction as its shorter side is placed in the back.

・Refill the humidifying pan with water early when the volume of water is decreased.

・Mixing any reagent in the humidifying water may have a bad influence on the cultivation. Especially when using the UV lamp, do not use any reagent. Because the UV light may deteriorate the reagent mixed with the humidifying water.

5. Set the humidifying pan with the inner side flush against the back, and close the inner door and the outer door.

Note: Set the humidifying pan with the inner side flush against the back. The humidity control bar in the duct keeps at low temperatures and inner moisture is recondensed. Slide the humidifying pan down right under the humidity control bar, otherwise the recondensed water drops will directly fall to the chamber bottom and will pool in the chamber bottom.

When the pooled water evaporates, it may leave a white mark on the chamber bottom. This is not a malfunction. Wipe it off with alcohol-soaked gauze or unwoven cloth. When the mark cannot be removed, scrub the mark off with using a cream cleanser.

Precautions for cultures

● **Leave space between culture containers.**
Always leave space for ventilation between culture containers (Petri dishes, flasks, etc.). Inadequate spacing may result in uneven temperature distribution and CO_2 gas density.

● **Do not place harmful materials in the chamber.**
Never place samples that release acidic, alkali, or corrosive gas in the chamber. Doing so may cause damage resulting from discoloration or corrosion.

● **Close the inner door.**
Always close the inner door before closing the outer door. Failure to close the inner door will adversely affect performance even if the outer door is closed.

● **Open and close the doors gently.**
Always open and close the doors gently. Closing the doors forcefully may cause spillage of the culture medium, incomplete closing, or damage to the gasket. Before opening the inner door, check through the glass to confirm that the UV lamp is OFF (if the MCO-230AICUVH/230AICUV or the optional MCO-170UVS is installed).

● **Be careful when closing the outer door.**
Use the handle when closing the outer door. Holding the door in other places may cause injury by getting fingers caught in the door. Do not lean on the outer door. Doing so may result in injury from the outer door coming loose or the incubator falling over, or it may cause current leakage or electric shock.

● **Be careful of the inside of the outer door.**
The inside of the outer door may become hot.

● **Avoid using excessive force on the inner door.**
Do not put your hand on the glass, poke it with sharp objects, or apply strong force. Doing so may result in injury from breaking the glass.

● **Check the cause of any alarm buzzer.**
If an alarm buzzer sounds while the incubator is in use, immediately check the cause of the alarm. For details on what may cause an alarm buzzer to sound, refer to page 83～85.

● **Vibration of a shaker.**
When stacking incubators and operating the shaker for CO_2 incubator MIR-S100C in the chamber of the CO_2 incubator, it may have a bad influence on the other.

Preventing contamination

To prevent contamination of the chamber, select a suitable installation site.

● **Avoid locations with high temperatures or humidity.**
Avoid locations with high temperatures or humidity, because of a greater presence of microorganisms in the air.

● **Avoid locations with passers-by or drafts.**
Avoid locations near doors, air conditioners, fans, etc., where passers-by or drafts can facilitate the entry of microorganisms into the chamber.

● **If possible, use a cleanroom.**
To achieve a better culture, it is recommended that a cleanroom be used if one is available.

● **Use clean containers.**
The greatest cause of contamination is dirty containers for cultures. Be careful not to get containers or trays dirty when taking them in and out.

● **Keep the chamber clean.**
Wipe off any fingerprints. If water spills from the humidifying pan, or if the doors are left open for a long time, condensation may form on the inside of the doors. If that occurs, wipe off the condensation with a dry sterile gauze. In particular, clean and disinfect the chamber if the culture medium is spilled. For details, refer to “ROUTINE MAINTENANCE” on page 82.

● **Use sterile distilled water in the humidifying pan.**
Always use sterile distilled water in the humidifying pan. Do not use ultrapure water, because it may cause red rust-like particles in the humidifying pan. Clean the humidifying pan once a month. In some cases, an antibacterial ingredient may precipitate in the humidifying water. This is not a malfunction.

● **Keep the incubator out of direct airflows from air conditioners or fans.**
Cool airflow from an air conditioner may cause condensation and lead to possible contamination.

CORRECT OPERATION

Use the following procedure to start trial operation or actual operation of the incubator.

1. Install the incubator correctly, referring to “INSTALLATION” on page 16 to 20.

2. Remove the packing materials from the chamber and inner attachments. Clean and disinfect the chamber and all the inner attachments, referring to “ROUTINE MAINTENANCE” on page 82.

3. Add approximately 1.5 L of sterile distilled water to the humidifying pan (Refer to page 25).

4. Connect the removal power supply cord that is provided, to the port on the lower rear side.

5. Connect the removable power supply cord to the outlet.

6. Turn ON the power switch on the lower right side of the incubator.

7. (MCO-230AICUVH/230AICUV or when an optional UV system set MCO-170UVS is installed.) Set the frequency of a power supply on the LCD touch panel (Refer to page 58～59).

⚠WARNING

Always use the removal power supply cord that is provided. Other power supply cord may cause electric shock or fire.

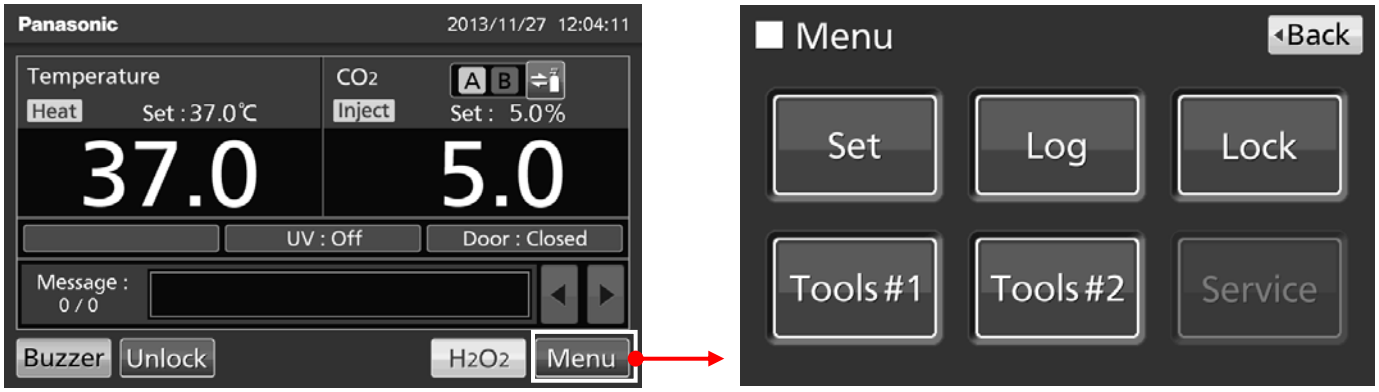
● **The provided removal power supply cord is only for this product.**
Never use it for any other products.

● **When the incubator is not in use**
Empty the water out of the humidifying pan and remove moisture from the chamber. Make sure that the chamber is completely dry before closing the doors. Failure to do so may result in damage.

● **Before moving the incubator**
Before moving the incubator, empty the water out of the humidifying pan, disconnect the power supply plug from the outlet, and make sure that the cord will not be damaged. Failure to do so may result in electric shock or fire.

BASIC OPERATION ON LCD TOUCH PANEL

●Operation from Menu key



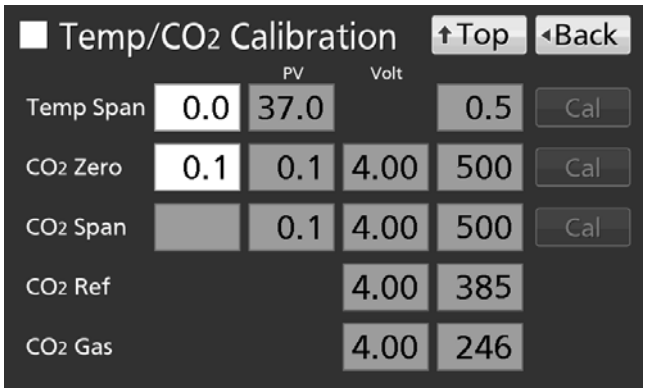
■Menu screen

				Page
◆Set →	**■Stand-by Setting screen**	(Setting)	Temp., CO_2 density, high limit temp. alarm	32～33
◆Log →	**■Log screen**			
	◆Chart → **■Chart screen**			
	◆Actual Temp.	(Display)	Chamber temp. log graph (can be exported)	42～44
	◆Actual CO_2 Level	(Display)	CO_2 density log graph (can be exported)	42～44
	◆Door Opening	(Display)	Outer door opening log graph (can be exported)	42～44
	◆Data Export → **■Export screen**			
	◆Actual Temp.	(Export)	Chamber temperature log	45～47
	◆Actual CO_2 Level	(Export)	CO_2 density log	45～47
	◆Door Opening	(Export)	Outer door opening log	45～47
	◆Setting	(Setting)	Log interval, Unique ID	41～42
	◆Alarm	(Display)	Alarm log (can be exported)	48～49
	◆Alarm Export	(Export)	Alarm log	50～52
◆Lock →	**■Lock screen**			
	◆Auto-Lock → **■Auto-Lock screen*1**	(Setting)	Auto-lock ON/OFF, User-ID ON/OFF	70～74
	◆KeyLock → **■Key Lock screen**	(Setting)	Key lock ON/OFF, password	34～37
	◆Auto-Lock User → **■Auto-Lock User screen**	(Setting)	User-ID, password	68～70
◆Tools#1 →	**■Tools#1 screen**			
	◆Temp./CO2 Calibration		Don't push (See Next page)	
	◆Alarm Setting #1	(Setting)	Temp. alarm, CO_2 density alarm	38～39
	◆Alarm Setting #2	(Setting)	Alarm delay, ring back, remote alarm etc	38～40
	◆UV Setting*2	(Setting)	UV timer, power supply frequency	57～59
		(Operate)	Lighting UV lamp for 24 hours	60～61
	◆STD Gas Setting*3	(Setting)	CO_2 density of standard gas	79～80
	◆STD Gas Calibration*3	(Operate)	Calibration of CO_2 density by STD gas	80～81
◆Tools#2 →	**■Tools#2 screen**			
	◆Date & Time	(Setting)	Date, time	53
	◆Brightness/Sleep	(Setting)	Brightness, sleep ON/OFF etc	54～55
	◆DAQ Setting*4	(Setting)	DAQ system ON/OFF, ID, speed etc	56

BASIC OPERATION ON LCD TOUCH PANEL

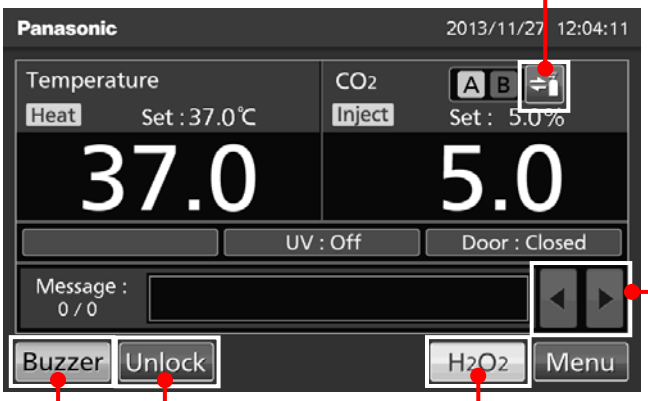
*1: MCO-230AICUVH or when an optional electric lock MCO-170EL is installed.
*2: MCO-230AICUVH/230AICUV or when an optional UV system set MCO-170UVS is installed.
*3: When an optional STD gas autocalibration kit MCO-SG is installed.
*4: Only when using an optional software product Data acquisition system MTR-5000.
Note: Service key is not available. (Qualified engineer only)

Note: On the Tools #1 screen, by mistakenly pressing Temp./CO_2 Calibration key, Temp./CO_2 Calibration screen is displayed.
When this screen is displayed, press Back key to return to the Tools #1 screen, or press Top key to return to the Top screen.
When these settings on this screen are changed, inaccurate temperature or CO_2 density may be displayed.



●Operation from other than Menu key

◆CO_2 gas supply line select key: (Operate) Manual changeover between CO_2 gas supply line A and B (Page 78)



◆Message select key: (Operate) Changing some messages

◆H_2O_2 key*5: (Operate) H_2O_2 decontamination (Page 62～67)

◆Unlock key*6: (Operate) Unlock the outer door. (Page 68～72)

◆Buzzer key: (Operate) Silencing the buzzer (Alarm is not canceled except for some alarms; page 84)

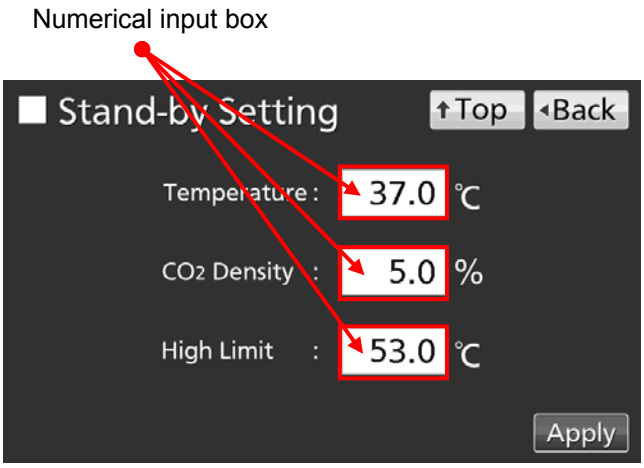
*5: Under any of the following conditions only.
・When an H_2O_2 generator MCO-HP is installed in the MCO-230AICUVH.
・When all H_2O_2 generator MCO-HP, H_2O_2 decon board MCO-170HB and electric lock MCO-170EL in the MCO-230AICUV.
・When all UV system set MCO-170UVS, H_2O_2 generator MCO-HP, H_2O_2 decon board MCO-170HB and electric lock MCO-170EL in the MCO-230AIC.

*6: For the MCO-230AICUVH or an optional electric lock MCO-170EL is installed, when the auto lock function is ON.

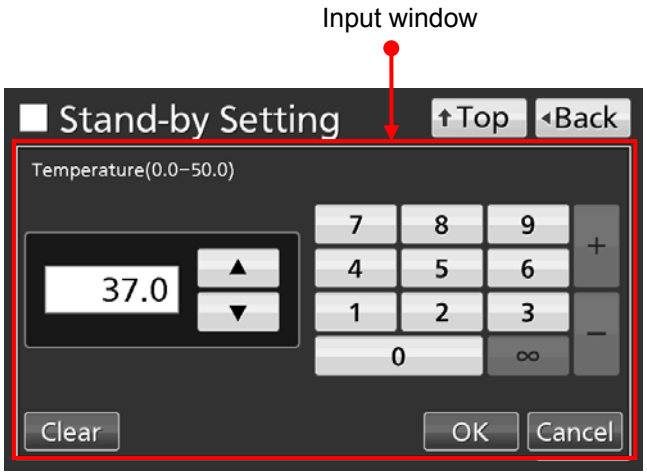
Numerical input to input window

On each screen in the LCD touch panel, it may be necessary to input numerical values on the numerical input box.

1. By pressing numerical input box, input window is displayed.



2. Press Numerical key or Up/Down key to input numerical value, and press OK key.



●Key description

・Numerical key (0～9):
Input numerical values.

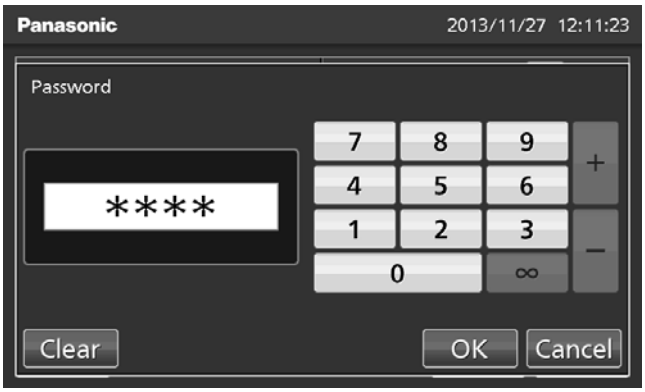
・Up/Down key (▲/▼):
Increases or decreases the numerical value displayed in the numerical input box.

・Clear key:
Deletes the numerical value displayed on the numerical input box.

・Cancel key:
Stops inputting on the numerical input box and closes the input window.

Note: While the input window is open, it is not possible to operate Top key and Back key.

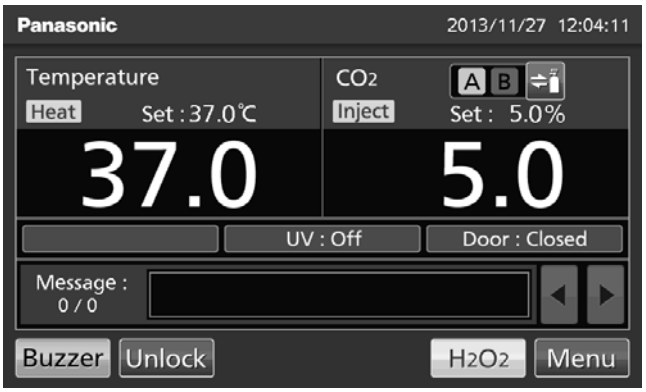
Note: Up/Down key may not be displayed.



Setting temperature, CO_2 density and high limit temperature alarm

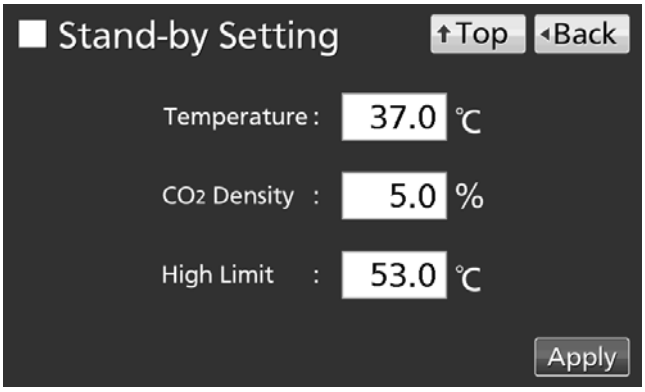
Set the chamber temperature, the CO_2 density and the temperature of the high limit temperature alarm for normal operation according to the following procedure. The incubator automatically starts operation using these settings after power-on.

1. Press Menu key to lead the Menu screen.



2. Press Set key to lead the Stand-by Setting screen.

3. Input each parameter. Press Apply key to save the input value. The display returns to the Menu screen.



●Each parameter setting

・Temperature: Set value of chamber temperature.

Settable range: 0.0 °C～50.0 °C, factory setting: 37.0 °C.

・CO_2 Density: Set value of chamber CO_2 density. Settable range: 0.0 %～20.0 %, factory setting: 0.0 %.

・High Limit: The high limit temperature alarm is different from the Automatic set temperature alarm (page 38), and it is independent temperature alarm. In case the chamber temperature exceeds the temperature of the high limit temperature alarm, this alarm is activated.

Settable range: 20.0 °C～53.0 °C, factory setting: 53.0 °C.

Refer to page 83～85 for detail of each alarm.

Note:

・When changing the set temperature from less than 45.0 °C to 45.0 °C or higher, the incubator readjusts the CO_2 sensor. During readjusting, “Status: Gas sensor initializing” is displayed in the Message display field, and “--.-” is displayed in the Present CO_2 density display field. After 15 minutes in the shortest, the incubator returns to the normal operation.

・When operating the incubator for the first time or after not using it for an extended period of time, operate it for at least about 4 hours until the chamber temperature and the CO_2 sensor are stable after setting the chamber temperature to the desired temperature and setting the CO_2 density to 0 %. Then change the setting to the desired CO_2 density.

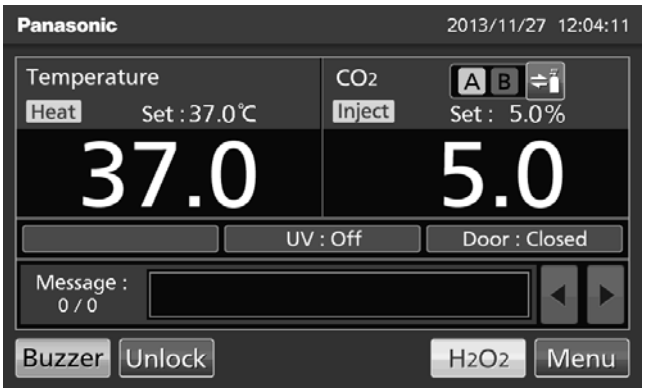
・Set the temperature of the high limit temperature alarm after the chamber temperature is stable at the set value.

・Set the high limit temperature alarm to at least 1 °C higher than the chamber set temperature.

4. On the Menu screen, press Back key to return to the Top screen.

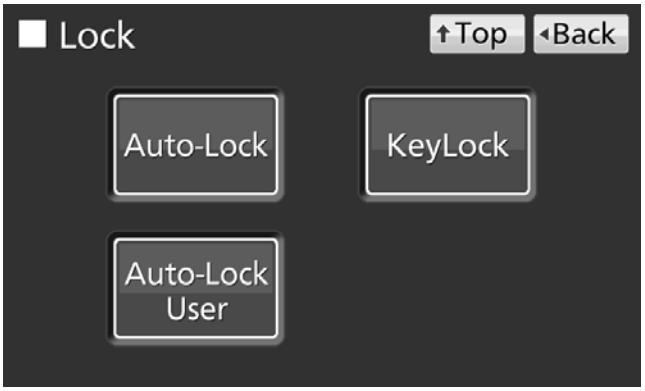
Setting key lock

1. Press Menu key to lead the Menu screen.

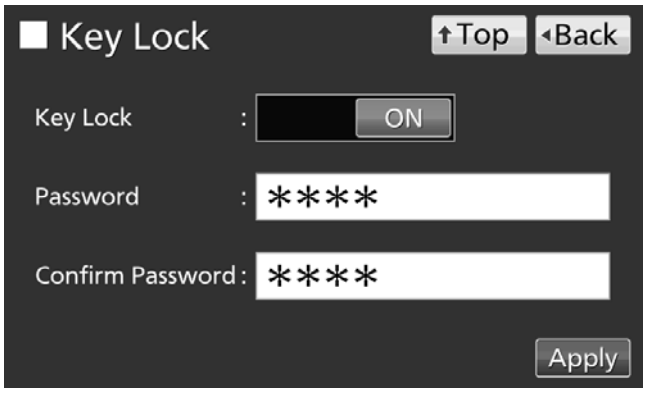


2. Press Lock key to lead the Lock screen.

3. Press KeyLock key to lead the Key Lock screen.



4. On the Key Lock screen, it is possible to set each setting of key lock. Press Apply key to change key lock ON and to save the password. The display returns to the Lock screen.



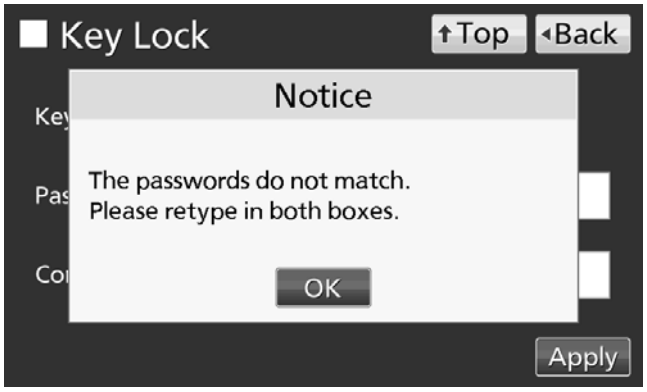
●Each setting of key lock

・Key Lock： By holding Key Lock slide key and sliding it to the right, Key Lock turns to ON.

・Password： The number (Max. 6-digit) inputted here are registered the release password of Key Lock.

・Confirm Password：

To prevent erroneous input, input the same password as Password input box. When inputting different password, Notice dialog box is displayed. Press OK key and input the correct password.

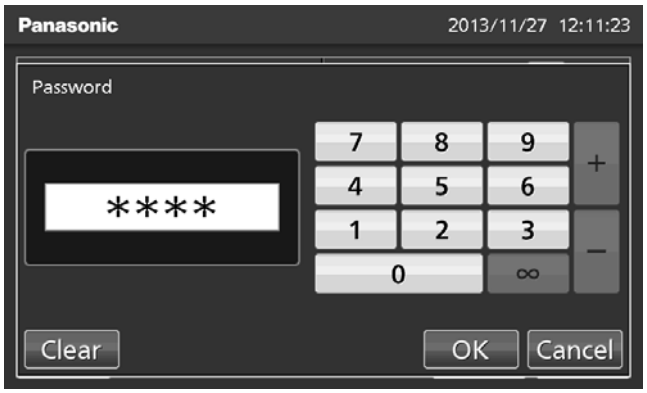


Note: To prevent abuse of the release password of Keylock, manage properly by limited administrators.

5. On the Lock screen, press Top key to return to the Top screen.

●Operation for Keylock-ON

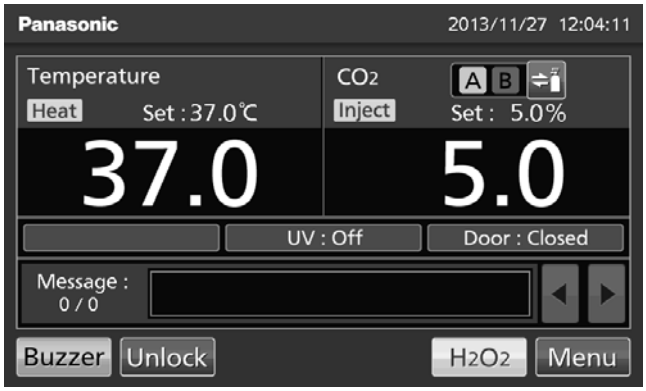
・When pressing any key except the CO_2 gas supply line select key, Buzzer key and Unlock key, Password input box is displayed, and input of the release password of Key Lock is required.



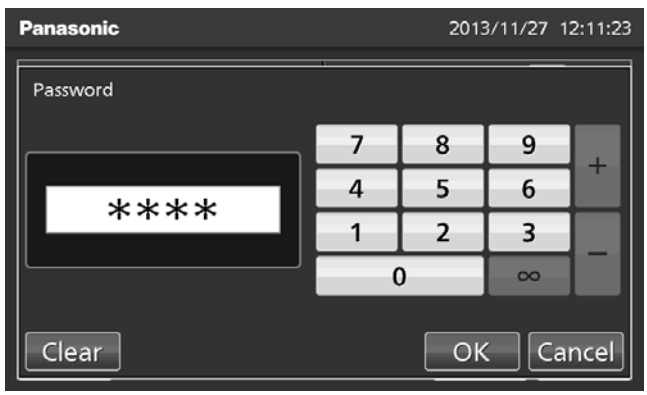
・When the inputted password is incorrect, Notice dialog box is displayed. Press OK key, and then input the correct password.

Removing key lock

1. By pressing Menu key, the Password input window is displayed.

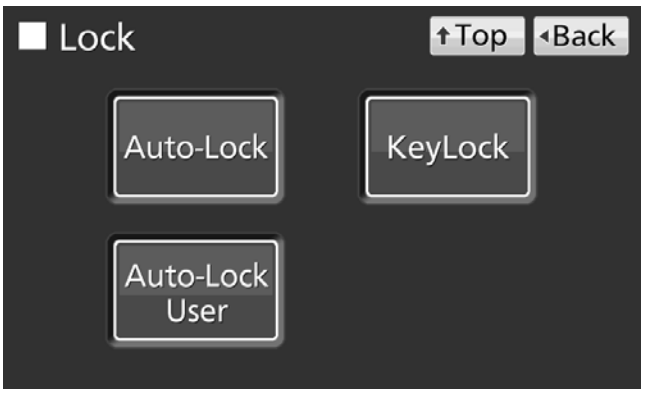


2. On Password input box, input the set release password of Key Lock, and press OK key to lead the Menu screen.

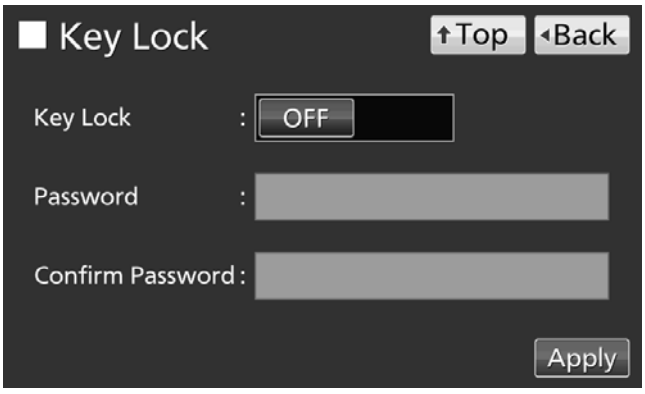


3. Press Lock key to lead the Lock screen.

4. Press KeyLock key to lead the Key Lock screen.



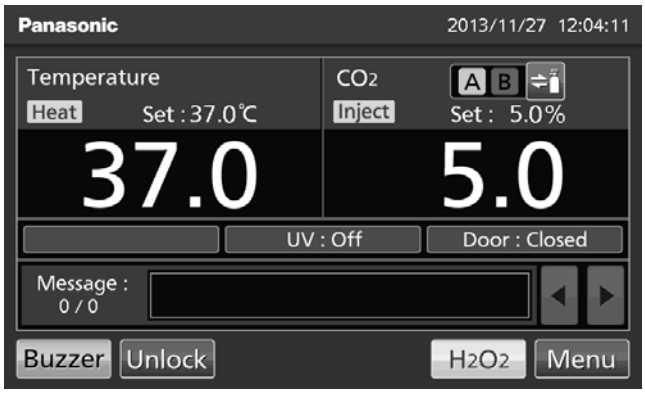
5. On the Key Lock screen, by holding Key Lock slide key and sliding to the left, change to OFF. Press Apply key to turn the key lock OFF. The display returns to the Lock screen.
Note: The release password of key Lock is deleted.



6. On the Lock screen, press Top key to return to the Top screen.

ALARM PARAMETERS

1. Press Menu key to lead the Menu screen.

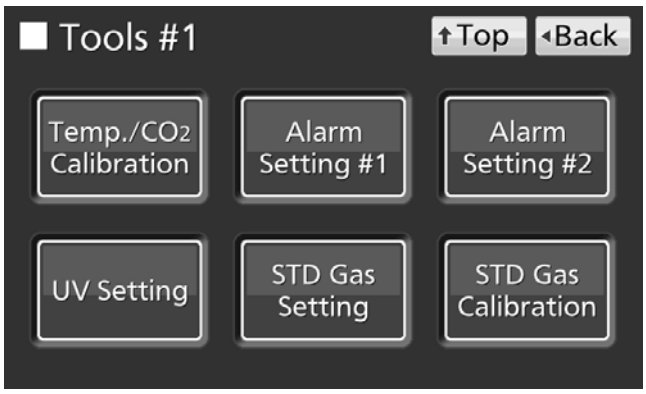


2. Press Tools #1 key to lead the Tools #1 screen.

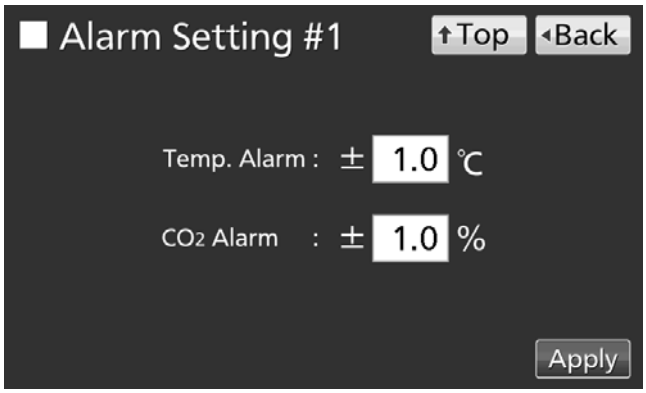
3. On the Tools #1 screen,

・Press Alarm Setting #1 key to lead the Alarm Setting #1 screen, it is possible to set automatic set temperature alarm and automatic set CO_2 density alarm (go to procedure **4**).

・Press Alarm Setting #2 key to lead the Alarm Setting #2 screen, it is possible to set alarm delay, door alarm delay, ring back and remote alarm (go to procedure **5**).



4. On the Alarm Setting #1 screen, input each parameter. Press Apply key to save the input value. The display returns to the Tools #1 screen.



●Each parameter setting

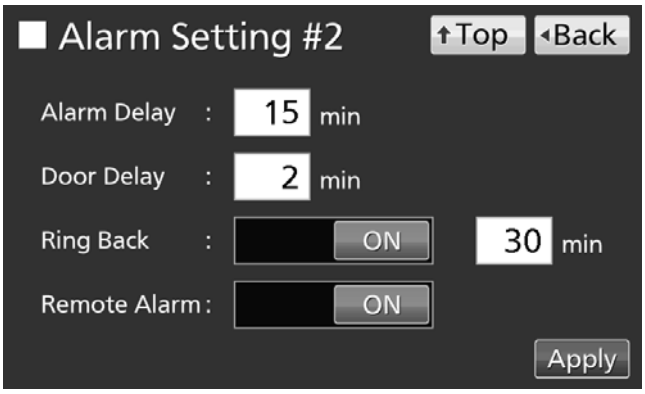
・Temp. Alarm:

When the chamber temperature exceeds the scope, the set temperature ± the set value of Automatic set temperature alarm, the alarm is activated. Settable range: ±1.0 °C～±5.0 °C, factory setting: ±1.0 °C.

・CO_2 Alarm:

When the chamber CO_2 density exceeds the scope, the set CO_2 density ± the set value of Automatic set CO_2 density alarm, the alarm is activated. Settable range: ±0.5 %～±5.0 %, factory setting: ±1.0 %.

5. On the Alarm Setting #2 screen, it is possible to set each alarm. Press Apply key to save the input value and setup. The display returns to the Tools #1 screen.



●Each setting

・Alarm Delay:

The function is that when the incubator is in the alarm state of Automatic set temperature or of Automatic set CO_2 density, the alarm buzzer will sound after the alarm delay set time passed. Settable range: 0 minute～15 minutes, factory setting: 15 minutes.

Note: When the incubator is recovered from the alarm state within the alarm delay time, the buzzer doesn't sound after the elapse of the alarm delay.

・Door Delay:

The function is that when the incubator is in the alarm state of door, the alarm buzzer will sound after the alarm delay set time passed. Settable range: 1 minute～30 minutes, factory setting: 2 minutes.

Note: When the incubator is recovered from the alarm state within the door alarm delay time, the buzzer doesn't sound after the elapse of the door alarm delay.

・Ring Back:

The function is that the alarm buzzer sounds again when the alarm state still continues after the alarm delay set time passed even though the alarm buzzer was stopped by pressing Buzzer key. By holding and sliding Ring Back slide key to the right, the Ring Back is turned to ON. Settable range: 1 minute～99 minutes, factory setting: 30 minutes.

Note: At Err01 (CO_2 gas cylinder empty), Err11・12 (CO_2 sensor error), Err18 (UV lamp failure) and Door alarm, the alarm is not re-activated because the alarm itself is deactivated by pressing Buzzer key (refer to page 83 and 84).

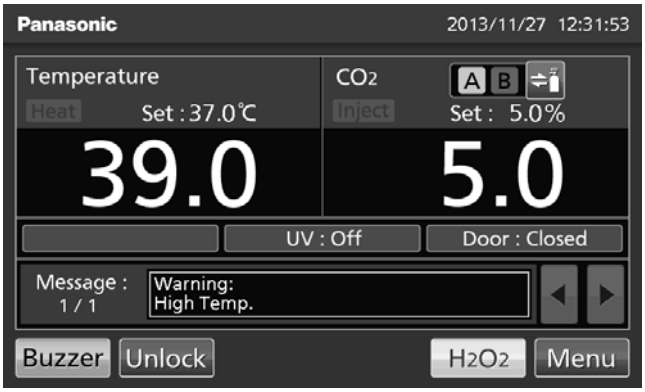
・Remote Alarm:

The function is that the remote alarm is continued even though the buzzer is stopped by pressing Buzzer key. By holding and sliding Remote Alarm slide key to the right, the Ring Back is turned to ON (not in conjunction with Buzzer key). Factory setting: ON.

6. (From procedure **4** and **5**) Press Top key to return to the Top screen.

ALARM PARAMETERS

●At the alarm state



・ While the incubator's alarm is being activated and the buzzer is being sounding, the buzzer is silenced by pressing Buzzer key. For the behavior at the time of pressing Buzzer key and the re-activation of alarm, under each setting condition, refer to Table 5-7 on page 84.

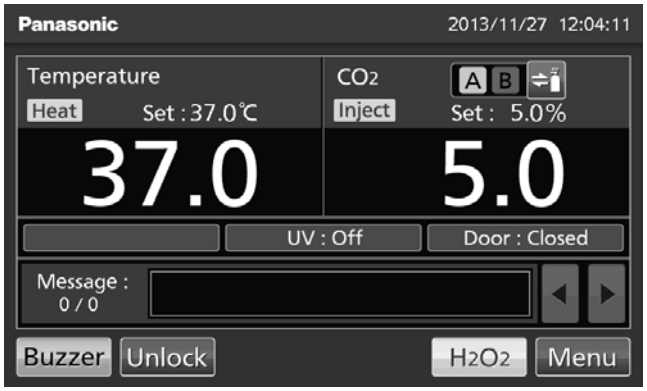
Resolve the cause of the alarm in reference to page 83-85 because the alarm itself is not deactivated by pressing Buzzer key except for some alarms.

Note: The buzzer for the high limit temperature alarm can't be silenced.

Setting log interval

The incubator is equipped with a function of saving operation log data (chamber temperature, CO_2 density and open/close state of outer door). Use the following procedure to set the log interval (interval of acquiring the operation log).

1. Press Menu key to lead the Menu screen.



2. Press Log key to lead the Log screen.

3. Press Setting key to lead the Setting screen.

4. On the Setting screen, input Log Interval. Press Apply key to save the input value. The display returns to the Log screen.
Settable range: 2 minutes～30 minutes.
Factory setting: 6 minutes.

Note: It is possible to register 8-digit alphanumeric characters as the Unique ID. Refer to page 47.

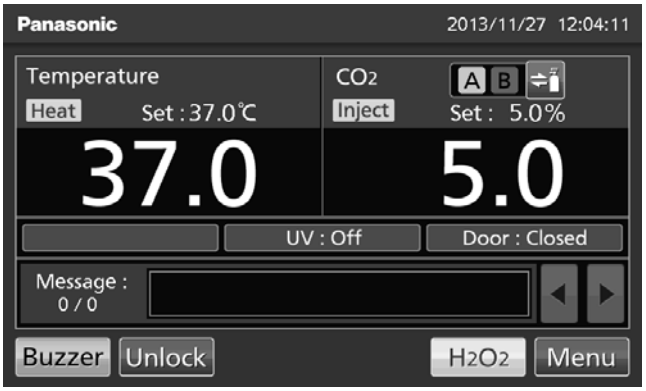
Note: Relation between log interval and the estimated amount of data that can be saved
Log interval=2 minutes: Approx. 46 days
Log interval=6 minutes: Approx. 135 days
Log interval=30 minutes: Approx. 664 days
When saving data more than the above, and the data is overwritten and the old data is delated.

5. Press Top key to return to the Top screen.

Displaying operation log

Operation log saved in the incubator can be displayed graphically on the LCD touch panel.

1. Press Menu key to lead the Menu screen.



2. Press Log key to lead the Log screen.

3. Press Chart key to lead the Chart screen.

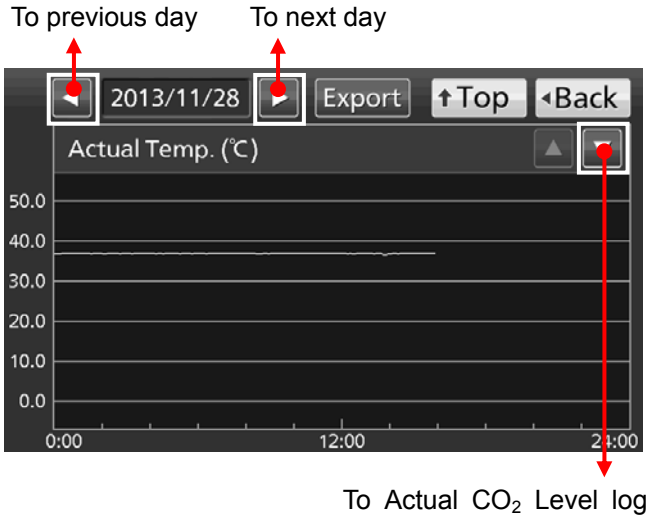
4. On the Chart screen, input the date (year / month / day) of the operation log you want to display graphically.

5. On the Chart screen, by pressing Show key after pressing the item you want to display graphically, the graph of each operation log is displayed.

・Actual Temp.:
Chamber temperature log graph
(Go to procedure **6**)
・Actual CO2 Level:
CO_2 density log graph
(Go to procedure **7**)
・Door Opening:
Open/close state of outer door log graph
(Go to procedure **8**)

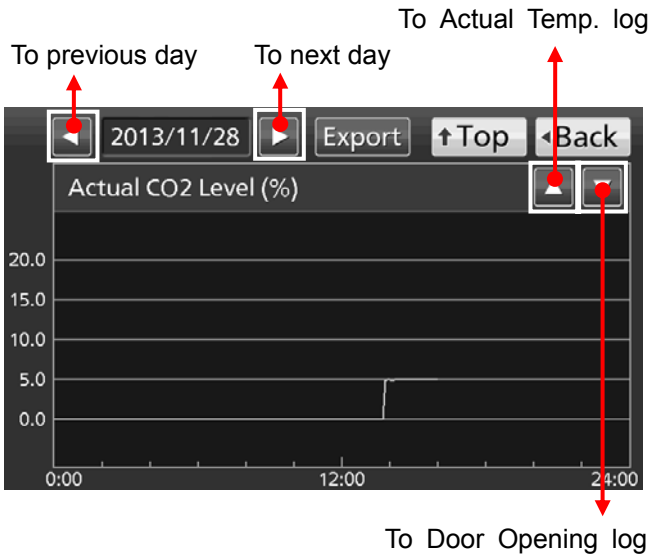
6. Actual Temp. log graph is displayed.

・Press Back key to return to the Chart screen.
・Press Top key to return to the Top screen.



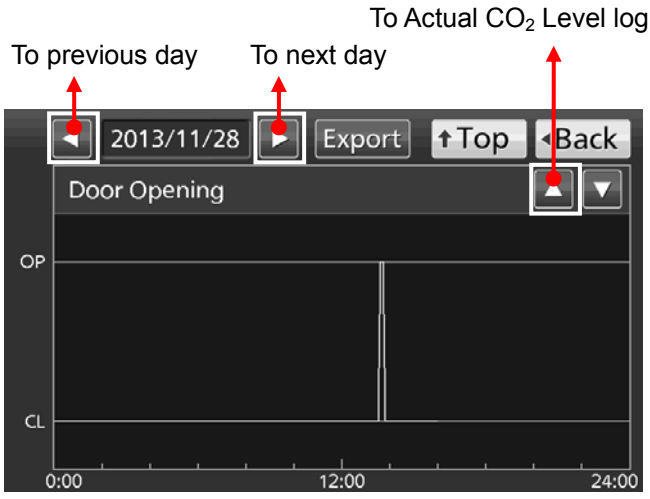
7. Actual CO_2 Level log graph is displayed.

・Press Back key to return to the Chart screen.
・Press Top key to return to the Top screen.



8. Door Opening log graph is displayed.

・Press Back key to return to the Chart screen.
・Press Top key to return to the Top screen.



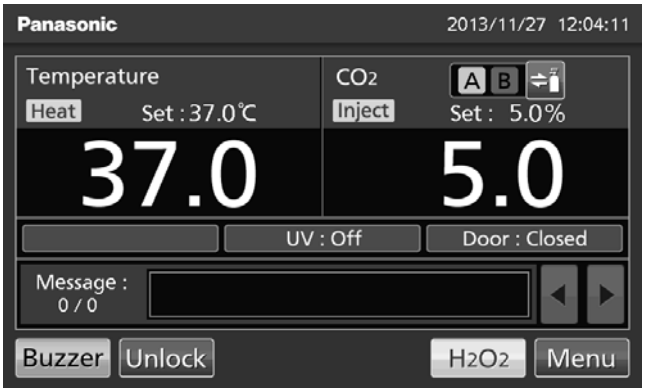
Note: The error of about 1 minute may be observed during a month. Refer to page 53 for the procedure of setting time.

Exporting operation log

Operation log data saved in the incubator can be exported in CSV format to the USB memory inserted into the USB port.

1. Insert the USB memory into the USB port.
Note: It is not possible to use a USB memory with security functions that requires entering password.

2. Press Menu key to lead the Menu screen.



3. Press Log key to lead the Log screen.

4. Press Data Export key to lead the Export screen.

5. On the Export screen, select the time period you want to export.

・To export the saved operation log data over the entire period, press All radio button.

・To export the operation log data of a specified date, press 1 Day radio button and input the date (year / month / day) of the operation log data you want to export.
Note: The error of about 1 minute may be observed during a month. Refer to page 53 for the procedure of setting time.

6. On the Export screen, select the type of operation log data you want to export.

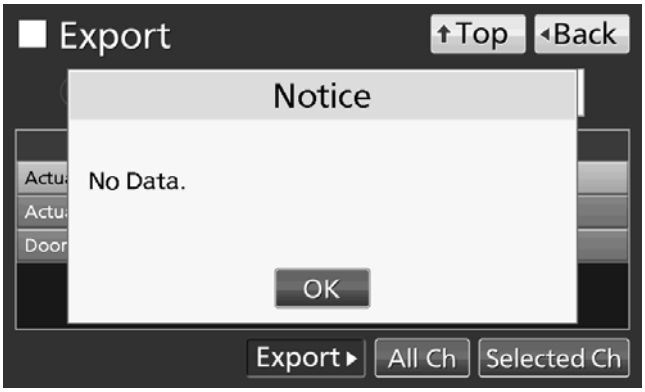
・To export all types of operation log data, press All Ch key.

・To export only operation log data you want to export, select operation log data you want to export, and then press Selected Ch key.
・Actual Temp.: Chamber temperature log data
・Actual CO2 Level: CO_2 density log data
・Door Opening: Open/close state of outer door log data*

* When both of the Auto-lock function and the User-ID mode are ON (refer to page 68～72), inputted User-IDs for unlocking the outer door are also exported.

Note: When no USB memory is inserted into the USB port, Notice dialog box is displayed. Press OK key, and then insert a USB memory into the USB port.

Note: When the specified operation log data doesn't exist, Notice dialog box is displayed. Press OK key, and then re-specified according to procedure **4** and **5**.



7. When the export is complete, Information dialog box is displayed. Press OK key.
Note: Even after the export of operation log data is complete, operation log data saved in the incubator are not deleted.

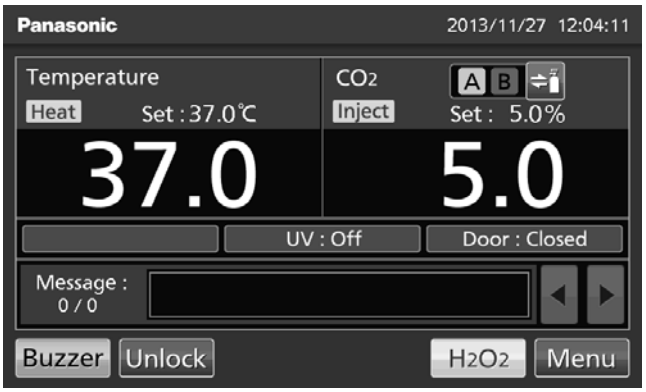
8. Remove the USB memory from the USB port.
Note:
・The log folder is created in the USB memory, and the exported file is saved in it in CSV format. The exported file name is in date (8 digits) - type of data format.
(e.g.) When exporting all types of data using All (from Oct. 1st, 2013 to Jan. 1st, 2014):
20131001-20140101_AllCh.csv
20131001-20140101_Door.csv
(e.g.) When exporting Actual Temp. using 1 Day (Jan. 1st, 2014):
20140101_Temp.csv
・On the beginning of the exported file, “MCO-230AIC” is written. However when the Unique ID is registered (refer to page 42), “MCO-230AIC” and Unique ID (8-digit) are written.
(e.g.) When “RoomA001” is set as the Unique ID of MCO-230AICUV:
MCO-230AIC, RoomA001

9. Press Top key to return to the Top screen.

Displaying alarm log

The incubator is equipped with a function of saving alarm log data (Max. 256 logs). Alarm log saved in the incubator can be displayed graphically on the LCD touch panel.
Note: When saving alarm logs more than 257, the oldest alarm log is deleted, and then overwritten.

1. Press Menu key to lead the Menu screen.



2. Press Log key to lead the Log screen.

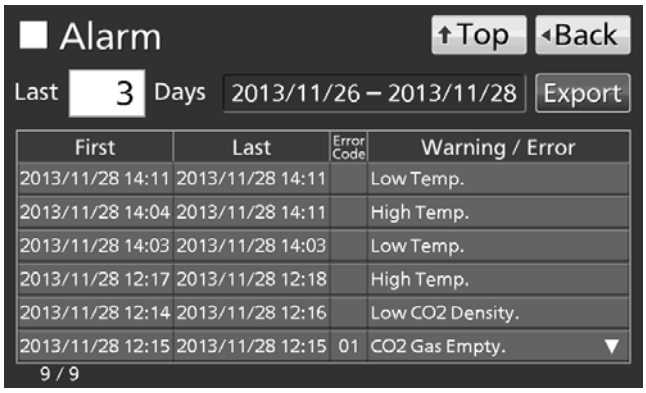
3. Press Alarm key to lead the Alarm screen.

4. On the Alarm screen, the newest 7 days' alarm logs (containing that day) are displayed.
Note: When the number of applicable alarm log is 6 or more, by pressing the top (▲) or the bottom (▼) log, the log table currently displayed scrolls and hidden alarm logs can be seen.

・Press Back key to return to the Log screen.
・Press Top key to return to the Top screen.

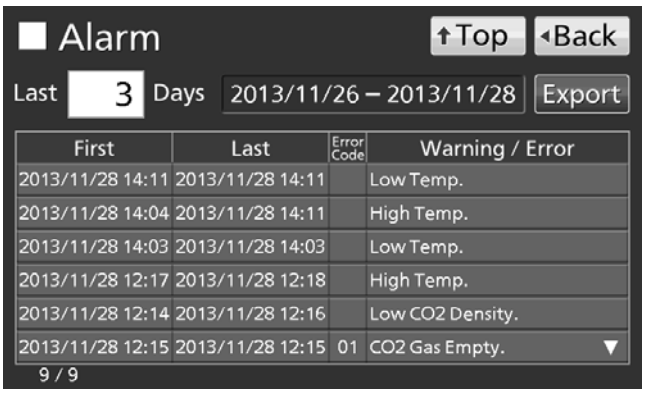
5. On the Alarm screen, by inputting days into the Last XX Days input box, alarm logs for specified days (containing that day) are displayed.
Settable range: 1 day～45 days.
Note: The error of about 1 minute may be observed during 1 month. Refer to page 53 for the procedure of setting time.

・Press Back key to return to the Log screen.
・Press Top key to return to the Top screen.



●On the Alarm screen of procedure **4** or **5**, alarm log data can be exported in CSV format to the USB memory inserted into the USB port.
6. Insert the USB memory into the USB port.
Note: It is not possible to use a USB memory with security functions that requires entering password.

7. Press Export key.



8. When the export is complete, Information dialog box is displayed. Press OK key. Refer to page 51 and 52 for the details about abnormal export or exported file name.

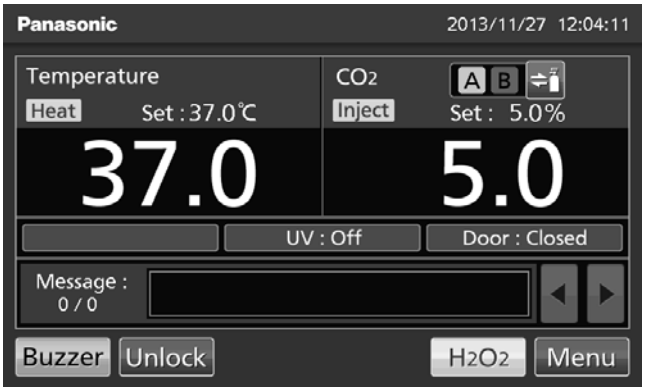
9. Press Top key to return to the Top screen.

Exporting alarm log

It is possible to export saved alarm log data to a USB memory inserted in the USB port by CSV format.

1. Insert a USB memory in the USB port.
Note: It is not possible to use a USB memory with security functions that requires entering password.

2. Press Menu key to lead the Menu screen.



3. Press Log key to lead the Log screen.

4. Press Alarm Export key to lead Alarm Export screen.

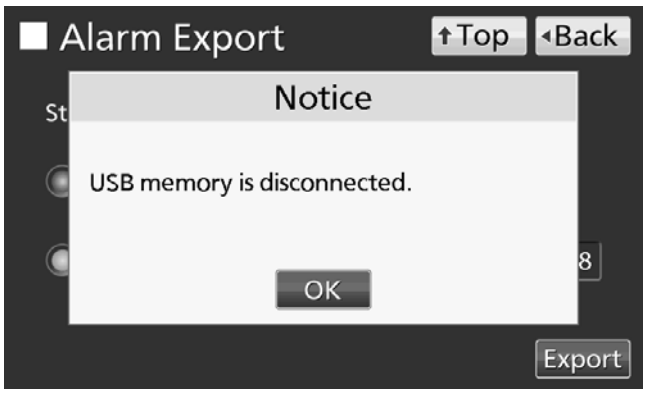
5. On the Alarm Export screen, select the period to export.

・To export the saved alarm log data over the entire period, press All radio button.

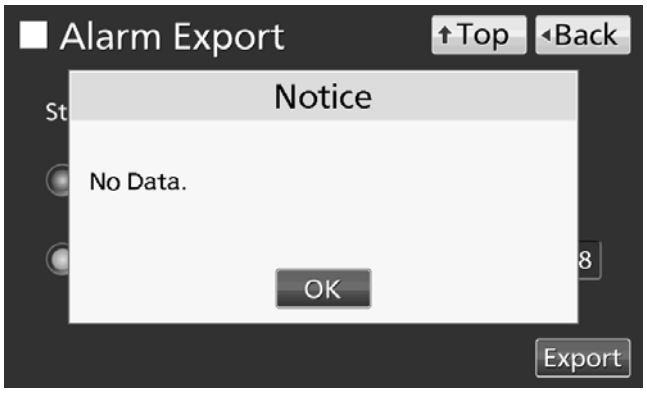
・To export the alarm log data for the specified days (The newest period containing that day), press Last XX Days radio button and input days.
Settable range: 1 day～45 days.
Note: The error of about 1 minute may be observed during 1 month. Refer to page 53 for the procedure of setting time.

6. Press Export key.

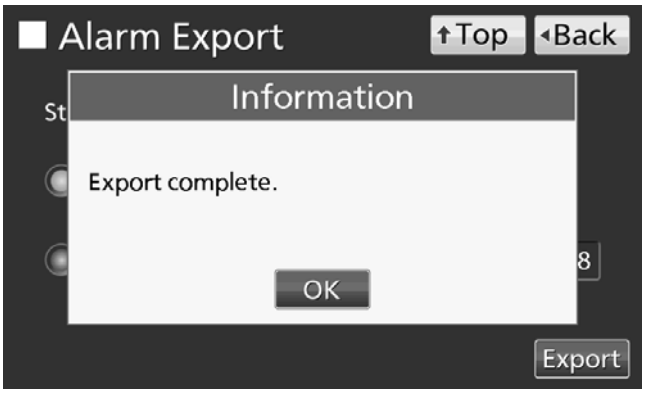
Note:
・When USB memory is not inserted in the USB port, Notice dialog box is displayed. Press OK key and insert an USB memory into the USB port.



・When alarm log data doesn't exist in the specified days, Notice dialog box is displayed. Press OK key and specify days again as shown in the procedure **5**.



7. Even after completion the export of alarm log data, Information dialog box is displayed. Press OK key.
Note: After completing the export of alarm log data, alarm log data saved at CO_2 incubator is not deleted.



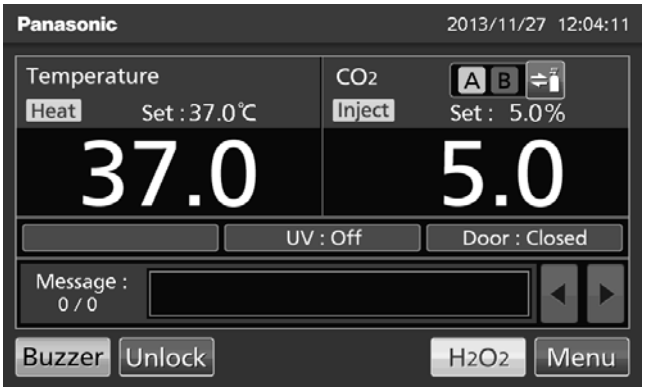
8. Remove a USB memory from the USB port.
Note: A log folder is created in a USB memory, and an exported data file is saved in the log folder by CSV format.
Exported file name; The first date during exported period (8 digits) + the last date (8 digits) + AlarmLog
Example) When exporting alarm log data for 7 days on January 7, 2014;
20140101-20140107_AlarmLog.csv

9. Press Top key to return to the Top screen.

OTHER PARAMETERS

Setting date and time

1. Press Menu key to lead the Menu screen.



2. Press Tools #2 key to lead the Tools #2 screen.

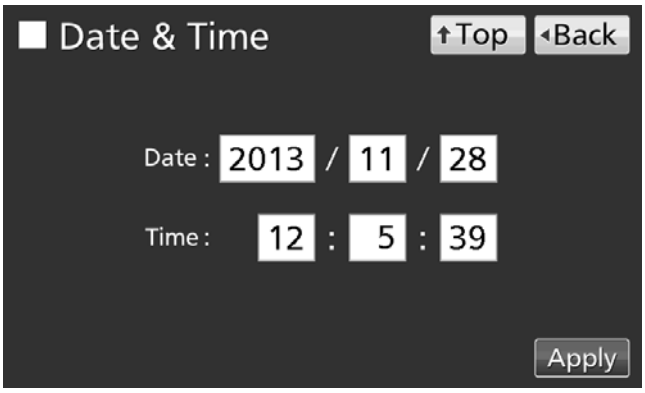
3. Press Date & Time key to lead the Date & Time screen.

4. On the Date & Time screen, input the present date and time. Press Apply key to save the input value. The display returns to the Tools #2 screen.

Note:

・24-hour clock.

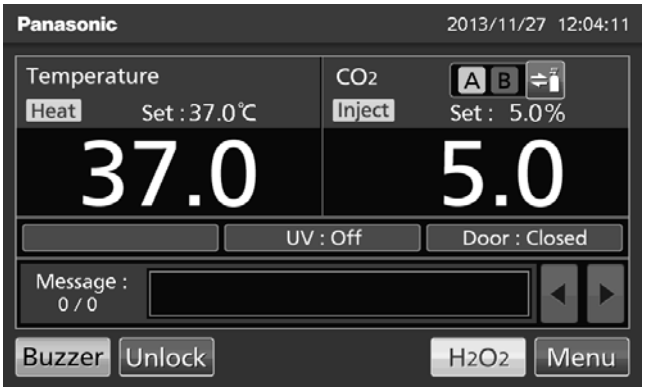
・It is recommended to set the time periodically since the error of about 1 minute may be observed during a month.



5. Press Top key to return to the Top screen.

Setting brightness and sleep

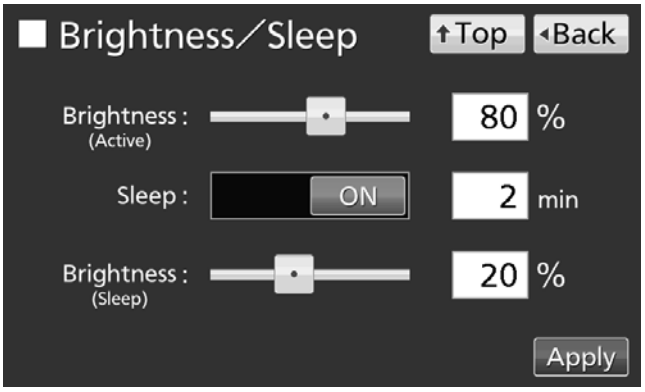
1. Press Menu key to lead the Menu screen.



2. Press Tools #2 key to lead the Tools #2 screen.

3. Press Brightness/Sleep key to lead the Brightness/Sleep screen.

4. On the Brightness/Sleep screen, each setting of brightness and sleep is available. Press Apply key to save the input value and setup. The display returns to the Tools #2 screen.



●Each setting

・Brightness(Active):

Brightness of LCD touch panel of the usual state. Adjust Brightness(Active) slide bar or input set value into the Brightness(Active) input box. Settable range: 50～100, factory setting: 80.

・Sleep:

The function is that the rightness of LCD touch panel is lowered to save electricity, when there is no key operation during set time.

By holding the Sleep slide key and sliding it right, the Sleep function is turned to ON. Input the set value of time to change the Sleep state. Settable range: 1 minute～5 minutes, factory setting: 2 minutes.

Note: It is not possible to operate any key in the Sleep state. By touching the LCD touch panel, the Sleep state is released and the LCD touch panel returns to the usual state. Under this condition, key operations are available.

・Brightness(Sleep):

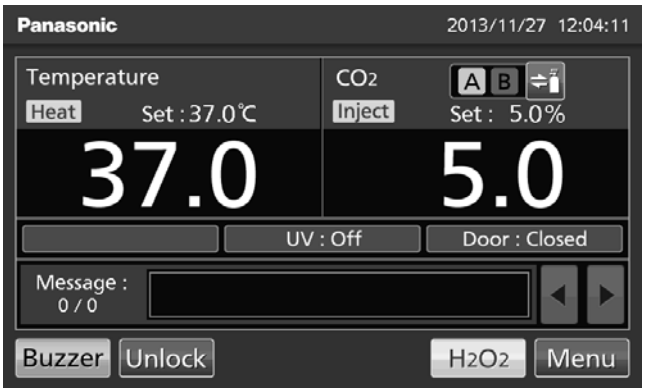
Brightness of LCD touch panel of the Sleep state. Adjust Brightness(Sleep) slide bar or input set value into the Brightness(Sleep) input box. Settable range: 0～50, factory setting: 20.

5. Press Top key to return to the Top screen.

Setting DAQ

It is necessary to set several parameters when using our optional software product Data acquisition system (DAQ) MTR-5000.

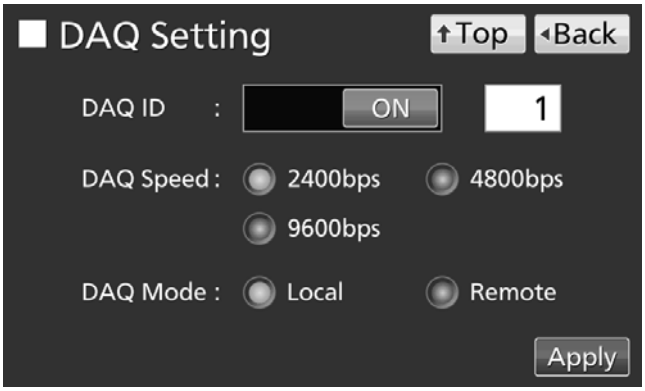
1. Press Menu key to lead the Menu screen.



2. Press Tools #2 key to lead the Tools #2 screen.

3. Press DAQ Setting key to lead the DAQ Setting screen.

4. On the DAQ Setting screen, each setting of DAQ is available. Refer to the Procedure Setting Manual Data Acquisition System MTR-5000 for details of settings. Press Apply key to save the input value and setup. The display returns to the Tools #2 screen.



5. Press Top key to return to the Top screen.

UV LAMP PARAMETERS

MCO-230AICUVH/230AICUV or when an optional UV system set MCO-170UVS is installed to the MCO-230AIC, UV lamp is workable.
After closing the outer door, UV lamp lights for the preset period*, to disinfect the water in the humidifying pan, and the air circulating in the chamber.

Using UV lamp

1. Correctly install all of the inner attachments, and place the cultivation samples on the trays.
Note:
・The humidifying pan and humidifying pan cover prevent UV light from leaking. Always use them even when not humidifying.
・Never turn ON the UV lamp when the humidifying pan cover is removed.
・Always use the humidifying pan cover even when using the incubator without turning ON the UV lamp. Using without humidifying pan cover may have a bad influence on the chamber temperature distribution and humidity recovery.

2. When closing the outer door, the UV lamp lights for the preset period*.
Note:
・If the outer door is opened while the UV lamp is lit, the lamp will turn OFF. Then, when the door is closed, the lamp will light for the preset period*.
・If only the outer door is repeated opened and closed, it may have a bad influence on the condensation in the chamber and chamber temperature distribution because the UV lamp generates heat for a long time. It may also shorten the service life of the UV lamp.
・The preset period* can be changed when necessary as shown in the page 58～59.
・To check whether the UV lamp is lit, open the outer door and then press the door switch with the inner door close. Visible blue light can be confirmed from the front of the humidifying pan cover.
Note: UV light is harmful to the eyes, so do not light the UV lamp when the inner door is open.

⚠WARNING
Do not look directly at UV light. UV light is harmful to the eyes.

3. If the outer door is not opened for at least 12 consecutive hours, the UV lamp lights for the preset period* every 12 hours.
Note: Outer door opening resets the 12-hours-count.

* The set period in UV Timer setting + the period extended by the UV Timer Ext.. Refer to page 59.

● The recommended replacement time for the UV lamp (i.e., when the UV output ratio drops to 60 % to 70 % of its initial value) is when the accumulated ON time reaches 5,000 hours. When the accumulated ON time reaches approximately 5,000 hours, “Warning: UV Bulb Life” is displayed in the message display field. It is recommended that the UV lamp be quickly replaced at this point. Contact our sales representative or agent for information on replacing the UV lamp.

UV LAMP PARAMETERS

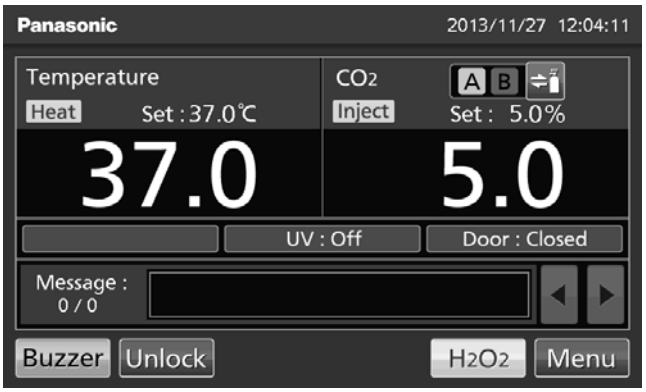
● If the UV lamp burns out, “Err18: UV Lamp Abnormal” is displayed in the message display field. If this occurs, replace the UV lamp. When replacing the UV lamp, replace the glow starter at the same time. Contact our sales representative or agent for information on replacing the UV lamp.

● If the UV lamp burns out (“Err18: UV Lamp Abnormal” is displayed in the message display field), it is not possible to perform H_2O_2 decontamination. Replace the UV lamp and the glow starter.

Setting UV lamp ON period

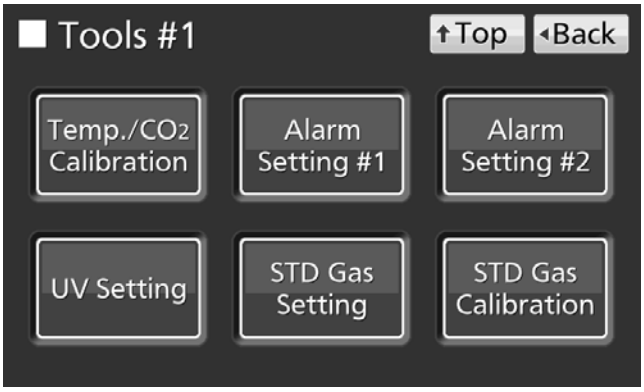
Use the following procedure to change the setting of the UV lamp ON period.

1. Press Menu key to lead the Menu screen.

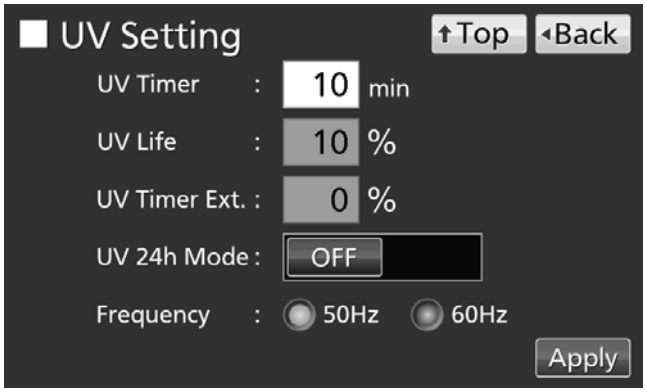


2. Press Tools #1 key to lead the Tools #1 screen.

3. Press UV Setting key to lead the UV Setting screen.



4. On the UV Setting screen, each setting of UV is available. Press Apply key to save the input value and setup. The display returns to the Tools #1 screen.



●Each setting

・UV Timer:

Set value of period to light UV lamp after closing the outer door.

Settable range: 0 minute～30 minutes, factory setting: 10 minutes.

Note:

・It is recommended to set the UV Timer for 10 minutes. The setting for less than 10 minutes may result in insufficient disinfection.

・When the UV timer is set for 0, the UV lamp does not light.

・UV Life:

The total time which UV lamp has turned on is displayed as the percentage to 5,000 hours which are recommendation time to replace. (It is impossible to set).

・UV Timer Ext.:

The more total time which UV lamp has turned on increases, the more UV ray output declines. In order to cover a decline of the UV ray output, the lighting time of UV lamp is automatically extended with an increase of total lighting time of UV lamp. (The set value of UV Timer is not changed).

Extension rate: 0 %～40 % (It is impossible to set), factory setting: 0 %.

Example) UV Timer: 10 minutes, UV Timer Ext.: 40 % → UV lamp lights for 14 minutes.

・Frequency:

Frequency of a power supply which this product is connected to. Press Frequency radio button of 50 Hz or 60 Hz.

5. Press Top key to return to the Top screen.

UV LAMP PARAMETERS

Lighting UV lamp for 24 hours

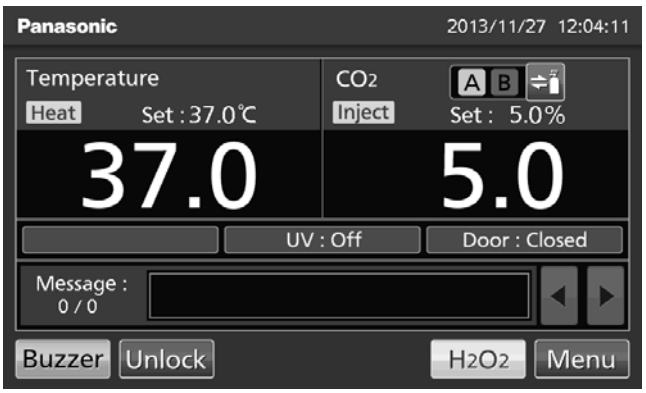
If the chamber has been contaminated by dirt or by spilling the medium, use the following procedure to decontaminate the chamber by lighting the UV lamp for 24 hours.

1. Remove all attachments from the chamber, including the trays, the fan cover, the duct, the fan, the humidifying pan, and the humidifying pan cover. Clean all the attachments in an autoclave or with alcohol for disinfection.

2. Clean and wipe off inside the chamber with alcohol for disinfection.

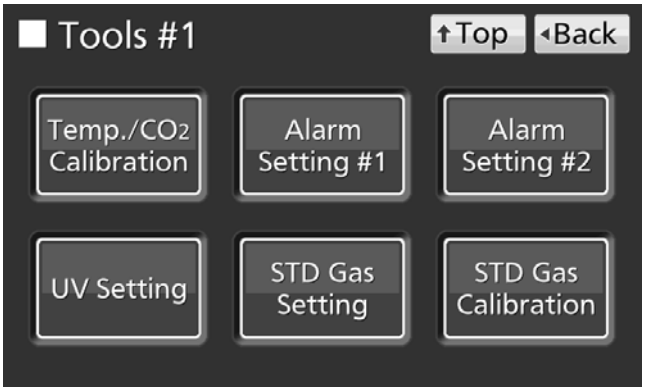
3. Set the CO_2 density to 0 %. Refer to page 32～33.

4. Press Menu key to lead the Menu screen.

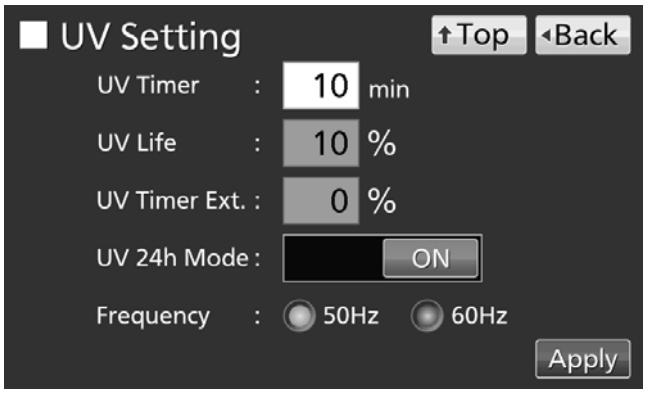


5. Press Tools #1 key to lead the Tools #1 screen.

6. Press UV Setting key to lead the UV Setting screen.



7. On the UV Setting screen, by holding the UV 24h Mode slide key and sliding it right, the UV 24h Mode is turned to ON. Press Apply key to start the UV 24-hour mode. The display returns to the Tools #1 screen.



8. The UV lamp lights continuously for 24 hours. “UV : ON” is displayed on the UV lamp condition display when UV lamp is lighting.

Note:

・The UV 24-hour mode may cause the automatic set temperature alarm because of a rising chamber temperature.

・After procedure **8**, by opening the outer door when UV lamp is lighting, UV lamp is turned OFF and UV 24-hour mode is canceled by opening the outer door. Redo from procedure **4** to start the UV 24-hour mode again.

9. Press Top key to return to the Top screen.

10. 24 hours after, UV lamp turns OFF automatically. Install all attachments removed in the procedure **1**.

H_2O_2 DECONTAMINATION

When the chamber is contaminated or when cleaning the chamber prior to starting a culture, it is possible to perform H_2O_2 decontamination.

H_2O_2 decontamination function is workable under any of the following conditions. When the condition is not fulfilled, H_2O_2 decontamination can not be performed.

・When an H_2O_2 generator MCO-HP is installed in the MCO-230AICUVH.

・When all H_2O_2 generator MCO-HP, H_2O_2 decon board MCO-170HB and electric lock MCO-170EL are installed in the MCO-230AICUV.

・When all UV system set MCO-170UVS, H_2O_2 generator MCO-HP, H_2O_2 decon board MCO-170HB and electric lock MCO-170EL are installed in the MCO-230AIC.

⚠WARNING

Use the reagent specified by our company for H_2O_2 decontamination. Using a different H_2O_2 solution may cause explosion or damage to the incubator, or insufficient decontamination.

Do not use chemicals other than the H_2O_2 reagent, such as alcohol. Doing so may result in damage to the H_2O_2 vapor generator.

⚠WARNING

When performing H_2O_2 decontamination, **make sure that the outer and inner doors are securely closed**. During H_2O_2 decontamination, plug the access hole with the silicon caps that are provided. Failure to do so may be harmful to health due to leakage of H_2O_2 gas.

⚠CAUTION

H_2O_2 decontamination can be performed only for the chamber and inner attachments with standard specifications, and not for any other objects.

⚠CAUTION

Perform H_2O_2 decontamination with the inner attachments arranged as specified by our company. Arranging them in a different way may result in insufficient decontamination.

⚠CAUTION

Wear rubber gloves when handling the H_2O_2 reagent. Direct contact with the H_2O_2 reagent may result in inflammation of the skin.

⚠CAUTION

After H_2O_2 decontamination has been completed, residual H_2O_2 solution will remain on the bottom of the chamber, the H_2O_2 vapor generator, and the bottom of the duct. **Wearing protective glasses and rubber gloves, wipe it off with a non-woven cloth**. Failure to do so may result in a deficient culture.

H_2O_2 decontamination

1. Take out all the trays, the fan cover, the duct, the humidifying pan cover and the humidifying pan from the chamber.

2. Dispose of the water in the humidifying pan, and wipe inner attachments removed from the chamber, with a gauze containing water or alcohol for disinfection.

3. Wipe the inside walls of the chamber with a gauze containing water or alcohol for disinfection.

4. Attach the duct and the fan cover.

5. Pour one bottle of the H_2O_2 reagent MCO-H2O2 into the H_2O_2 generator MCO-HP (Fig. 1).

6. Set the two pins on the H_2O_2 generator in the 2 holes on the lower left side of the duct (Fig. 1).
Note: Make sure that the H_2O_2 generator is securely attached. Uncertain attachment may result in insufficient decontamination.

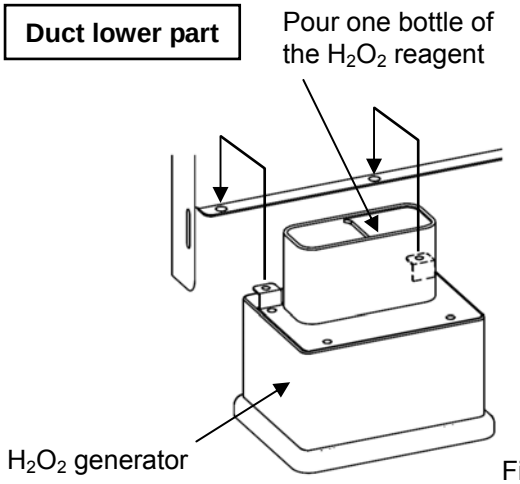


Fig. 1

7. Remove a connector cap from connector on bottom right of the far side of the chamber. Connect the H_2O_2 generator and connector by a cable that is provided (Fig. 2).
Note: Be sure to keep the connector cap.

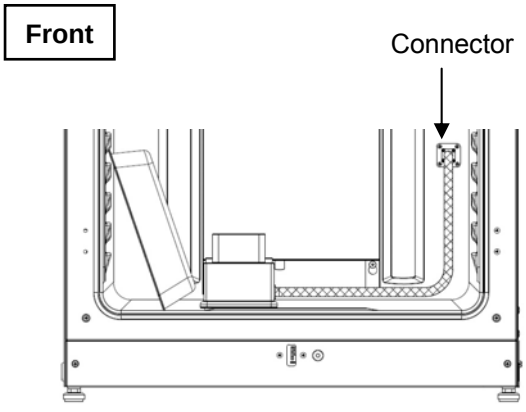


Fig. 2

8. Insert 4 trays in the 2nd, the 3rd, the 4th and the 6th tray catches from the top of the chamber side.
Note: The trays included as accessory are designed to be appropriate for decontamination. If half tray (MCO-35ST, optional) or trays for previous models are used, decontamination may not be sufficiently effective.

9. Set the humidifying pan cover, the humidifying pan removed in the procedure **1** (Fig. 3).
Note: H_2O_2 decontamination can be performed only for the chamber and inner attachments with standard specifications, not for any other objects.

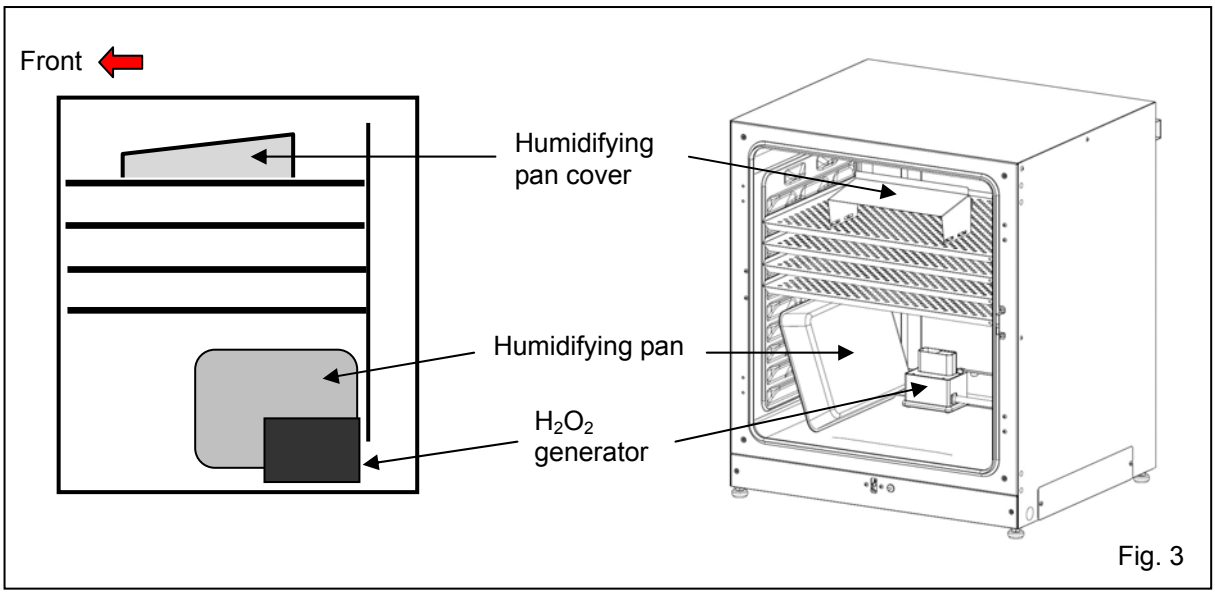
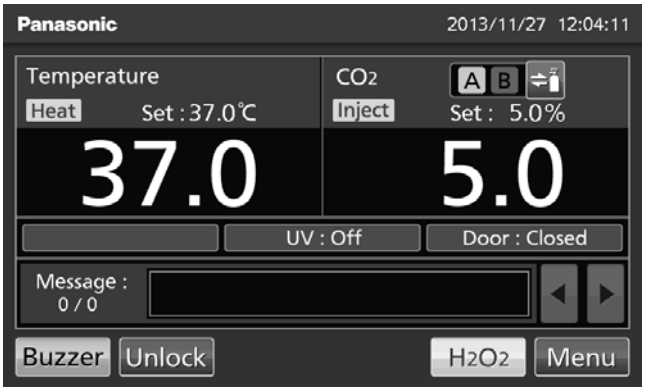


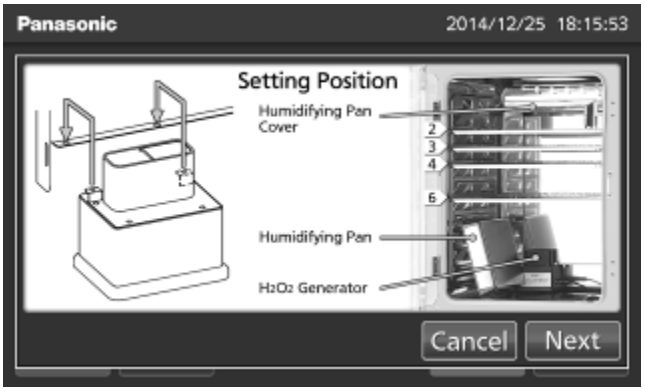
Fig. 3

10. Make sure that the duct, the fan and the H_2O_2 generator are securely attached (refer to Fig. 1 to 3 on page 88). After that, close the inner door and the outer door.

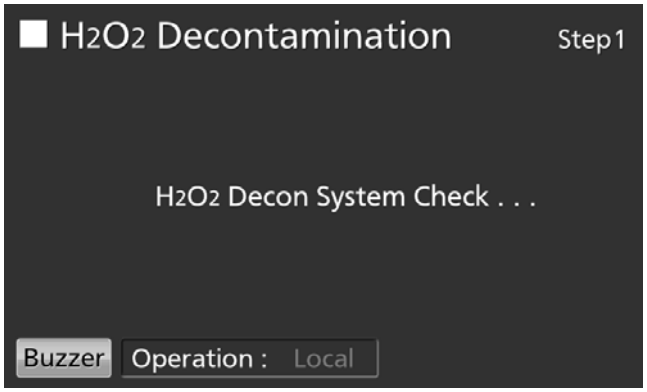
11. Press H_2O_2 key for 3 seconds to open Setting Position window.
Note:
・When the model does not have H_2O_2 decontamination function, H_2O_2 key is not displayed on the Top screen.
・When key lock is ON, Password input window is opened and input of the release password of Key Lock is required. Refer to page 36.



12. Finally make sure that the inner attachments and the H_2O_2 generator are attached correctly. After confirm, press Next key to lead the H_2O_2 Decontamination screen.



13. On the H_2O_2 Decontamination Step1 screen, the system check starts automatically. If the system is normal, the display leads the H_2O_2 Decontamination Step2 screen. When the system is abnormal, refer to Table 8 on page 85.

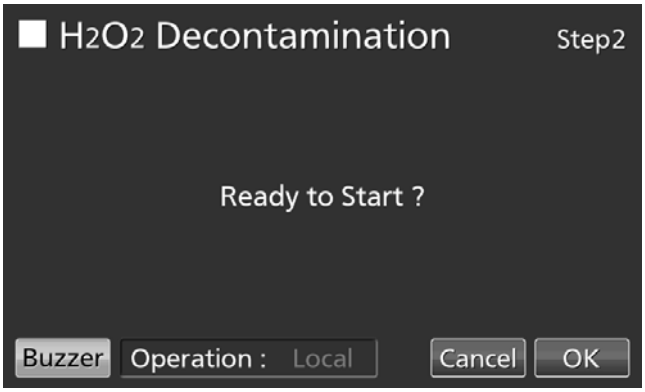


14. On the H_2O_2 Decontamination Step2 screen, press OK key to lead the H_2O_2 Decontamination Step3 screen and H_2O_2 decontamination is started. H_2O_2 decontamination is performed automatically from Step3 to Step8 (procedure **15**).

Note:

・The outer door is locked with electric lock for safety until completion of H_2O_2 decontamination.

・Buzzer sounds when H_2O_2 decontamination is completed (About 100 minutes later).



⚠CAUTION

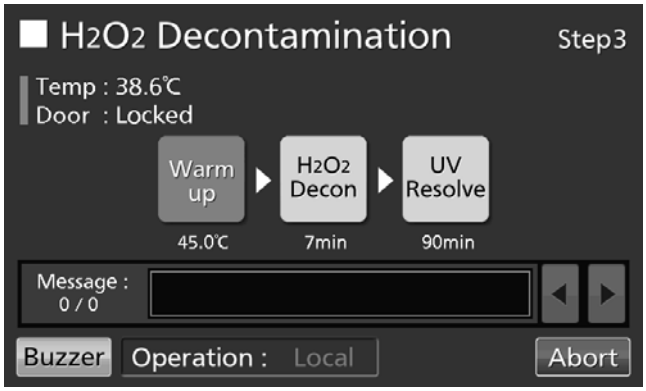
The electric lock will remain locked if power supply is cut off during H_2O_2 decontamination. After the power supply is recovers, the H_2O_2 gas resolution process will start execution and finish automatically. Execute the decontamination again because the decontamination is not completed.

⚠WARNING

Do not use the unlock key to unlock the outer door during H_2O_2 decontamination or during H_2O_2 gas resolve by UV. Doing so may cause harm to health from H_2O_2 gas leakage.

● Step3 is the process to warm the chamber temperature to 45 °C.

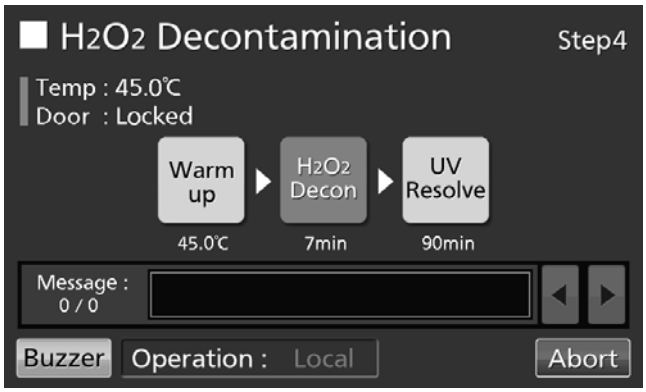
Note: By pressing Abort key, H_2O_2 decontamination is stopped in the middle of decontamination and go to Step8 (The End of H_2O_2 decontamination).



H_2O_2 DECONTAMINATION

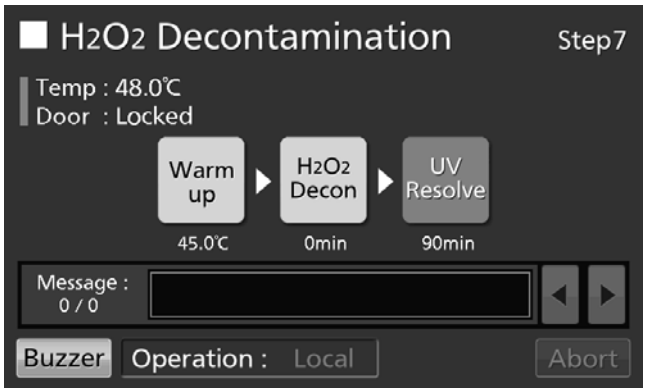
●Step4 is the process to decontaminate in the chamber by generating H_2O_2 vapor from H_2O_2 generator.

Note: By pressing Abort key, H_2O_2 decontamination is stopped in the middle of decontamination and go to Step7 (The process to resolve H_2O_2 vapor by UV lamp). It is not possible to skip Step7.



●Step7 is the process to resolve H_2O_2 vapor by UV lamp.

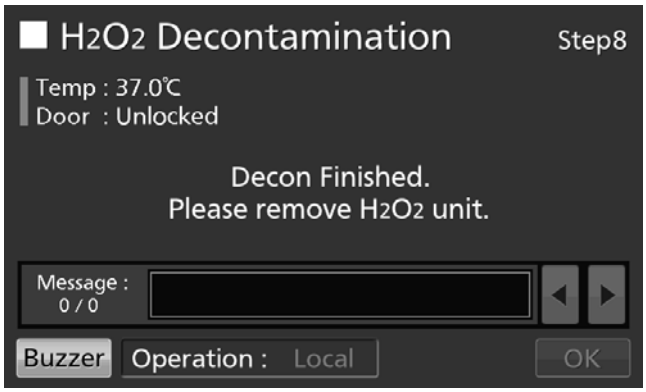
Note: Step5 and Step6 do not exist.



15. When the H_2O_2 decontamination is completed, the H_2O_2 Decontamination Step8 screen is displayed.

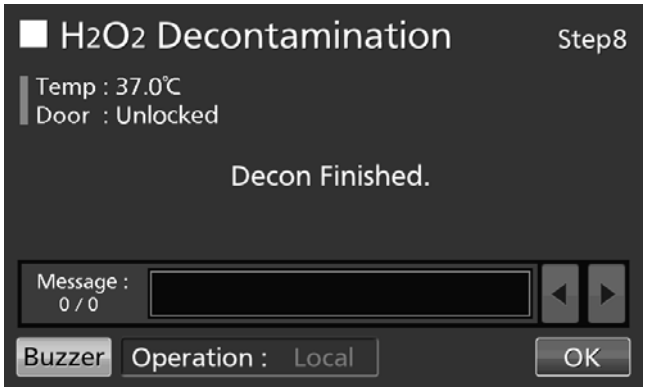
Open the outer and inner doors. Disconnect connector of the chamber, cable and H_2O_2 generator, and remove H_2O_2 generator and cable from the chamber.

Note: When doing the above work, put on protection glasses and rubber gloves.



16. On the H_2O_2 Decontamination Step8 screen, press OK key to return to the Top screen.

Note: When H_2O_2 generator is connected with connector of the chamber by cable, OK key is not workable.



17. Dilute the remaining H_2O_2 reagent in the H_2O_2 generator with a large volume of water and dispose of it. Rinse and wash the H_2O_2 generator with distilled water. Then keep the H_2O_2 generator in a clean environment outside of the chamber.

Note: Do not wash either the inside or outside of the H_2O_2 generator with alcohol.

18. After H_2O_2 decontamination, surplus H_2O_2 liquid will remain at the bottom of the chamber and in the bottom part of the H_2O_2 generator duct. This solution contains H_2O_2 at a low density, so put on protective glasses and rubber gloves and wipe it up with a non-woven cloth.

19. Ventilate the chamber sufficiently and place all the attachments back into the chamber.
Note: After H_2O_2 decontamination, cover the connector on the chamber side with the connector cap deeply. (Fig. 4)

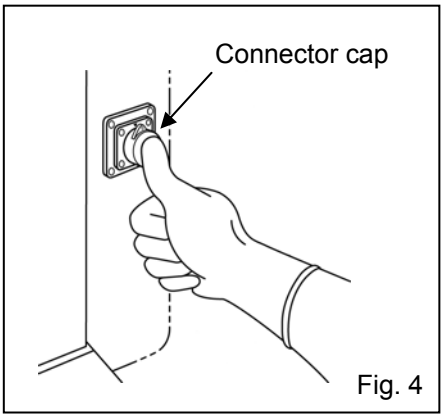


Fig. 4

Precautions when handling H_2O_2 reagent

Observe the following precautions when handling optional H_2O_2 reagent MCO-H2O2.

● Handling precautions
・Wear protective equipment, such as protective glasses and rubber gloves.
・Do not use fire in the area where the reagent is being handled.
・Do not leave any reagent in the container after it has been used or while it is being used.
・Do not place inflammable or combustible materials near the area where the reagent is handled.

● Precautions for storage
・Store in a cool, dark place.
・Always close the container cover securely to prevent impurities from becoming mixed in the reagent.
・Check the container to make sure that there is no damage, corrosion, or cracking.
・Store the container with the inlet facing upwards, and make sure that the container will not tip or be knocked over.

● Precautions for disposal
・Dispose according to the rule in your country.

Using unlock key

● Unlocking when power is interrupted
MCO-230AICUVH or when an optional electric lock MCO-170EL is installed to the MCO-230AICUV/ 230AIC, outer door is locked with electric lock under a power outage. To unlock the outer door while the power is interrupted, use the unlock key that is provided. To re-lock the outer door, turn the unlock key to the lock direction while the outer door is open. After the outer door has been locked condition manually, then close the outer door.
Note: The outer door cannot be locked by using the unlock key while the outer door is closed. Lock the outer door while it is open. Attempting to turn the unlock key while the outer door is closed may damage the electric lock system.

⚠WARNING
Do not use the unlock key to unlock the outer door during H_2O_2 decontamination or during H_2O_2 gas resolve by UV. Doing so may cause harm to health from H_2O_2 gas leakage.

ELECTRIC LOCK (OPTION)

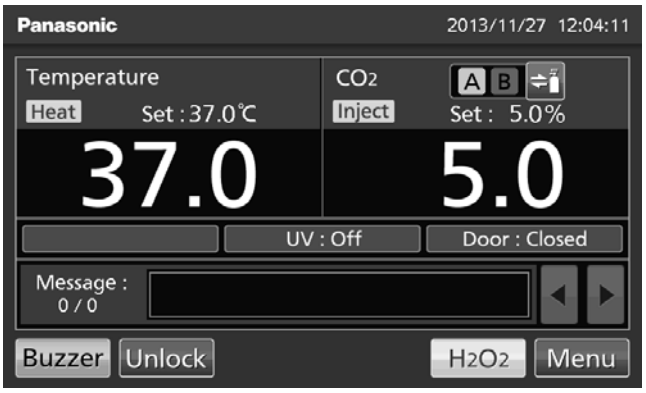
Auto lock function is that the outer door is locked automatically when the setting time passed after the door closed. Auto lock function is workable under any of the following conditions.
・MCO-230AICUVH
・When an optional electric lock MCO-170EL is installed in the MCO-230AICUV/230AIC.

The modes of unlocking the outer door are as follows.
・Quick mode: Press the Unlock key.
・User-ID mode: Input the User-ID and release password of Auto-Lock, after pressing the Unlock key.

Setting User-ID

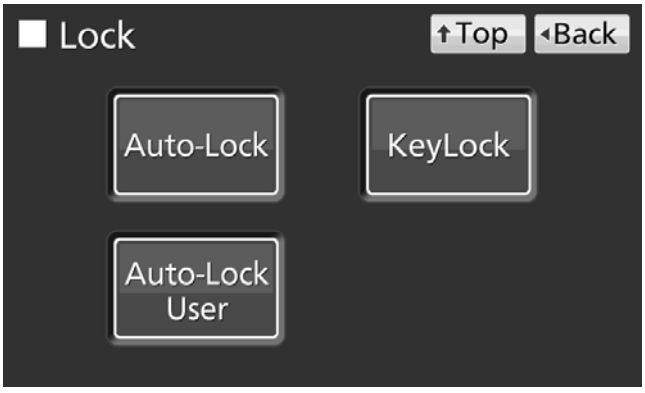
Before turning the User-ID mode to ON, use the following procedure to register a User-ID and a release password of Auto-Lock.

1. Press Menu key to lead the Menu screen.

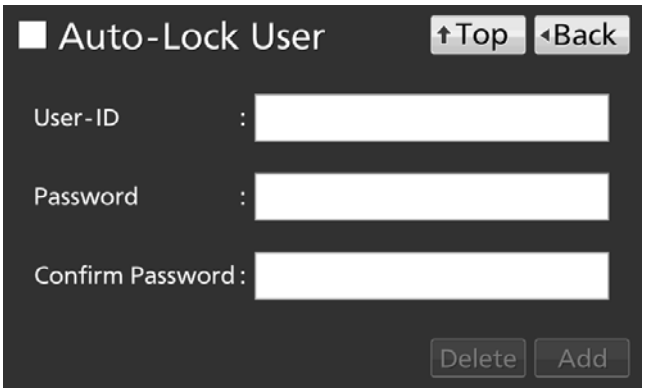


2. Press Lock key to lead the Lock screen.

3. Press Auto-Lock User key to lead the Auto-Lock User screen.



4. On the Auto-Lock User screen, it is possible to register a User-ID and its password. Press Apply key to save the User-ID and its password.



●Each setting of Auto-Lock

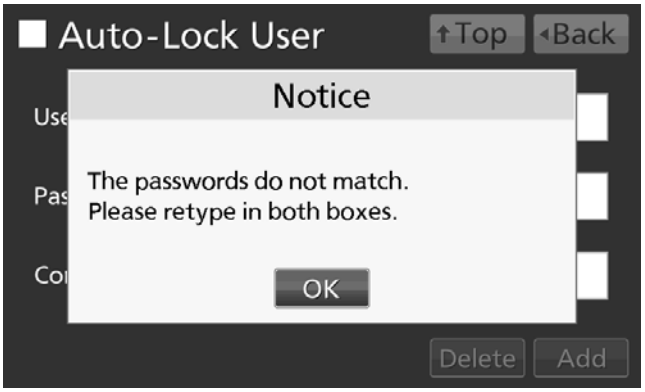
・User-ID: The alphanumeric characters (Max. 8-digit) inputted here are registered as a new User-ID.

・Password: The number (Max. 6-digit) inputted here are registered a new release password of Auto-Lock of the User-ID.

Note: It is possible to register only a User-ID without registration of a release password of Auto-Lock.

・Confirm Password:

To prevent erroneous input, input the same password as Password input box. When inputting different password, Notice dialog box is displayed. Press OK key and input the correct password.



Note:

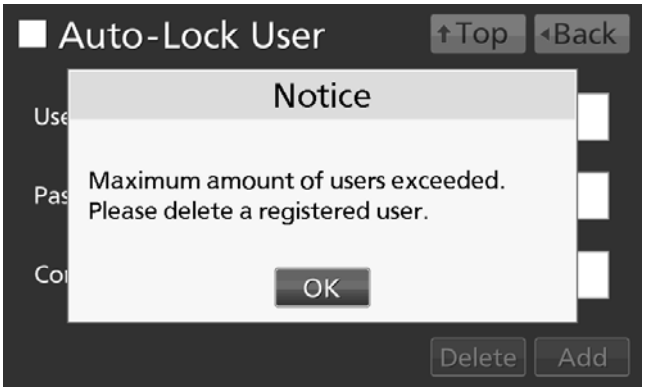
・A release password of Auto-Lock is for unlocking the outer door. It is different from the release password of Key Lock (refer to page 34～36).

・It is possible to input up to 8-digit alphanumeric characters as a User-ID.

・It is possible to input up to 6-digit numbers as a release password of Auto-lock.

・It is possible to register up to 99 User-IDs (and its passwords). When registering the 100th User-ID, notice dialog box is displayed. Press OK key, and then delete a disused User-ID in reference to page 70.

・To prevent abuse of User-IDs and release passwords of Auto-Lock, manage properly by limited administrators.



●Changing a registered User-ID's password

Input the registered User-ID into User-ID input box, and input its new password into Password input box and Confirm Password box. Press Add key to re-write the new password.

●Deleting a registered User-ID

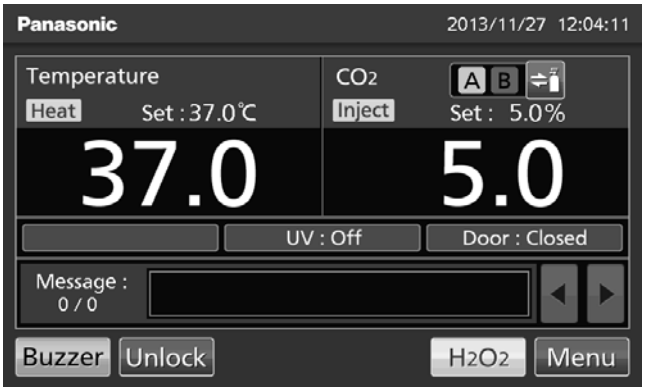
Input the registered User-ID into User-ID input box, and input its registered password into Password input box. Press Delete key to delete the registered User-ID (and its password).

Note: When deleting all registered User-IDs, the User-ID mode is turned to OFF (refer to page 70).

5. On the Menu screen, press Back key to return to the Top screen.

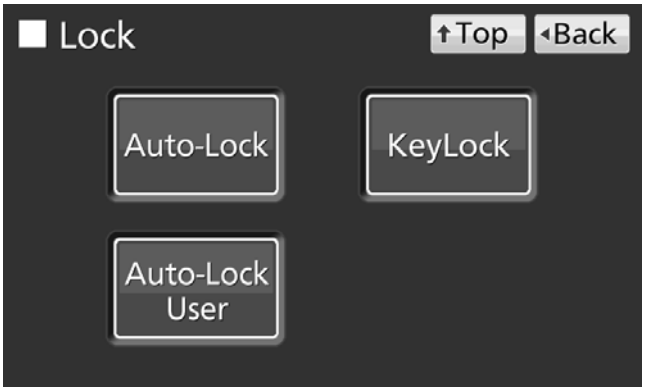
Setting auto lock

1. Press Menu key to lead the Menu screen.



2. Press Lock key to lead the Lock screen.

3. Press Auto-Lock key to lead the Auto-Lock screen.



4. On the Auto-Lock screen, each setting of auto lock is available. Press Apply key to turn the auto lock ON and save the set value. The display returns to the Lock screen.

●Each setting of auto lock

・Auto-Lock:

Auto lock function is that the outer door is locked automatically when the setting time passed after the door closed. By holding the Auto-lock slide key and sliding it right, the Auto-lock is turned to ON. Settable range: 1 minute～60 minutes, Factory setting: 1 minute.

・User-ID:

Choose the mode of unlocking the outer door between the quick mode or the User-ID mode. By holding the User-ID slide key and sliding it right, the User-ID mode is turned to ON. Factory setting: OFF (quick mode).

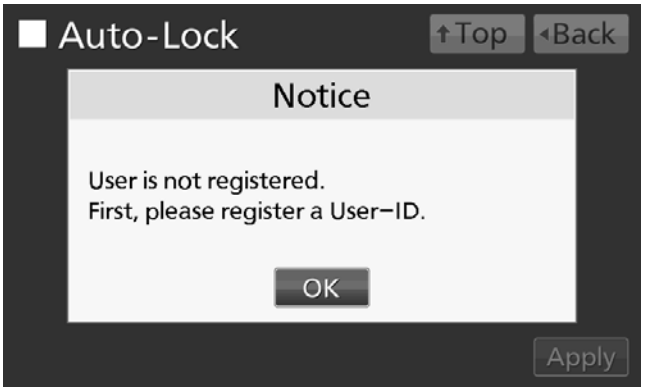
Note:

・When no User-ID is registered, notice dialog box is displayed. Press OK key, and then register a User-ID and its password in reference to page 68～70.

・In the User-ID mode, User-ID which is inputted to unlock the outer door is saved as the open/close state of outer door log data (refer to page 45～46).

・When changing the User-ID mode to OFF, registered User-IDs are not deleted.

・When deleting all registered User-IDs, the User-ID mode is turned to OFF (refer to page 70).

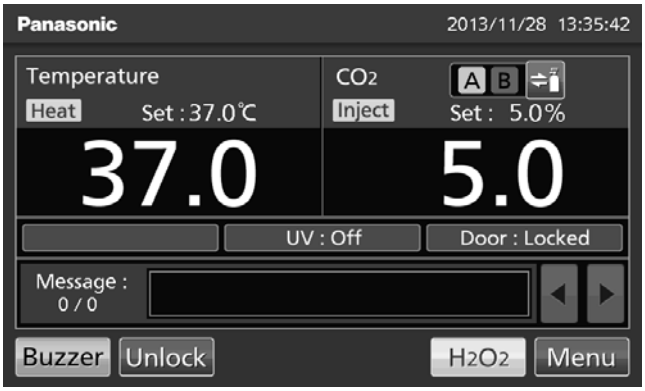


5. Press Top key to return to the Top screen.

ELECTRIC LOCK (OPTION)

●Unlocking the outer door

・In the quick mode, press the Unlock key on the Top screen to unlock the outer door.



・In the User-ID mode, when pressing Unlock key on the Top screen, User-ID input box is displayed. Input the User-ID and its release password of Auto-Lock.

Note: The User-ID which is inputted at this time is saved as the open/close state of outer door log data (refer to page 45～46).

・When the inputted User-ID or its password is incorrect, Notice dialog box is displayed. Press OK key, and then input the correct User-ID or its password.

Note: When the unlocked outer door is closed and the setting time passes, the unlocked outer door is re-locked automatically.

Using unlock key

● **Unlocking when power is interrupted**

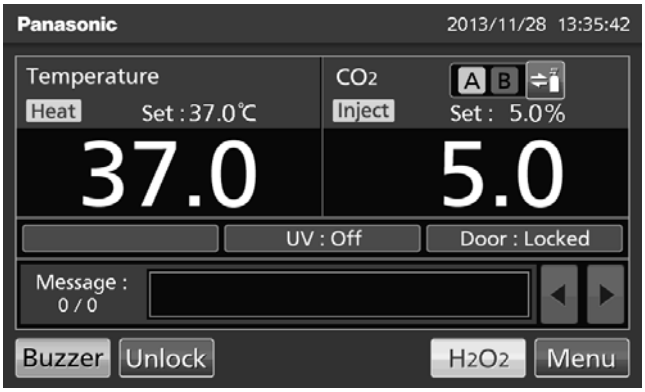
MCO-230AICUVH or when an optional electric lock MCO-170EL is installed to the MCO-230AICUV/ 230AIC, outer door is locked with electric lock under a power outage. To unlock the outer door while the power is interrupted, use the unlock key that is provided. To re-lock the outer door, turn the unlock key to the lock direction while the outer door is open. Close the outer door after the out door is locked manually.

Note: The outer door cannot be locked by using the unlock key while the outer door is closed. Lock the outer door while it is open. Attempting to turn the unlock key while the outer door is closed may damage the electric lock system.

ELECTRIC LOCK (OPTION)

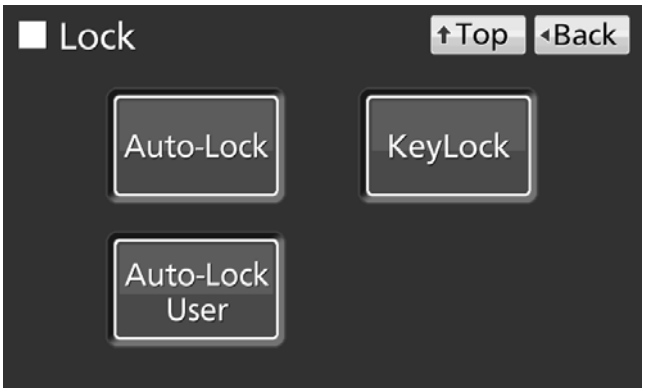
Removing auto lock

1. Press Menu key to lead the Menu screen.



2. Press Lock key to lead the Lock screen.

3. Press Auto-Lock key to lead the Auto-Lock screen.



4. On the Auto-Lock screen, by holding the Auto-lock slide key and sliding it left, the Auto-lock is turned to OFF. Press Apply key to change Auto-lock OFF, and the display returns to the Lock screen.

5. Press Top key to return to the Top screen.

GAS AUTO CHANGER (OPTION)

When an optional gas auto changer MCO-21GC is installed, there are two connecting ports for CO_2 gas pipe, A and B. By connecting two CO_2 gas cylinders, this kit switches the CO_2 gas supply line when one of the CO_2 gas cylinders becomes empty.

Connecting CO_2 gas cylinder

1. Get two CO_2 gas cylinder ready (CO_2 gas cylinder A and B) and install an optional gas regulator MCO-100L in both of CO_2 gas cylinders.

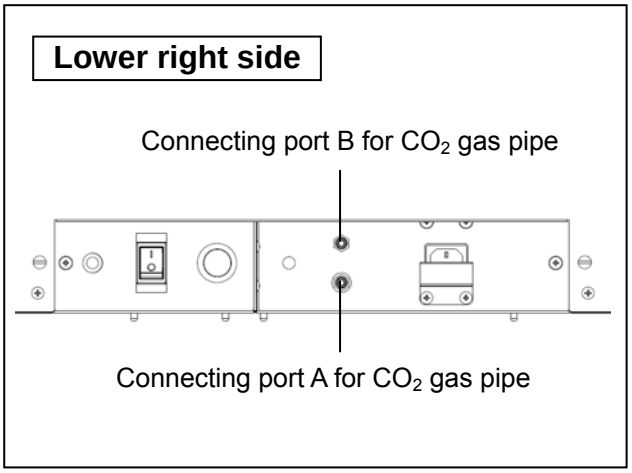
Note:

・Use a liquefied CO_2 gas cylinder (at least 99.5 % pure). The siphon (dip tube) type cannot be used.

・When MCO-100L is not available, install a gas regulator rated at 25 MPa(G) (250 kgf/cm^2(G), 3600 psi(G)) for the primary side, and 0.2 MPa(G) (2 kgf/cm^2(G), 30 psi(G)) for the secondary side.

2. Using a gas tube that is provided, connect the connecting port A for CO_2 gas pipe and the gas regulator of the CO_2 gas cylinder A.

3. Using a gas tube that is provided, connect the connecting port B for CO_2 gas pipe and the gas regulator of the CO_2 gas cylinder B.



Note: If the CO_2 gas is supplied to multiple CO_2 incubators from a single gas cylinder, a CO_2 solid will be formed in the gas regulator. The gas regulator safety valve will operate, and it may make an explosive sound.

4. After connecting the gas tube, make sure that no gas is leaking (ex. by using a gas leak detection spray).

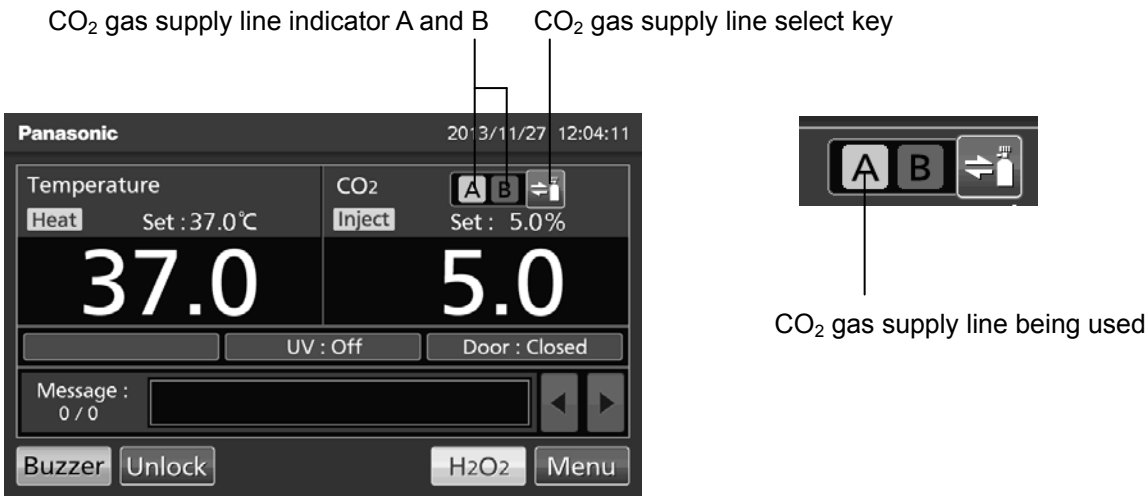
5. Both CO_2 gas cylinder A and B, set the CO_2 gas on the secondary side to 0.03 MPa(G) (0.3 kgf/cm^2(G), 4.3 psi(G)) for gas injection.

Note: As the pressure increases, the CO_2 gas density control range will increase. Excessive pressure may cause gas supply lines inside the incubator to come loose, which may result in gas poisoning or oxygen deprivation due to the escaping of gas. If gas lines come loose, the incubator must be repaired.

GAS AUTO CHANGER (OPTION)

Automatic CO_2 gas supply line changeover

When an optional gas auto changer MCO-21GC is installed, CO_2 gas supply line indicator A･B and CO_2 gas supply line select key are displayed in the Top screen. CO_2 gas supply line indicator A or B being used is lighted.



When the CO_2 density level remains unchanged, even though the CO_2 gas valve in the unit is opened, the unit regards the present connecting CO_2 gas cylinder as an empty. The CO_2 gas supply line is changed over automatically. These movements are displayed (Table. 2).

1. When CO_2 gas is remaining in CO_2 gas cylinder A, the unit operates with CO_2 gas supplied from CO_2 gas cylinder A (Situation **1** on table 2).

2. When CO_2 gas cylinder A is empty, the level of CO_2 density in the unit does not increase because CO_2 gas is not supplied into the unit even though CO_2 gas valve in the unit is open (Situation **2** on table 2).

3. When the Situation **2** continues for 2 to 3 minutes, CO_2 gas supply line is changed over automatically by regarding CO_2 gas cylinder as an empty. At this time, CO_2 gas empty alarm is activated, the buzzer sounds, and CO_2 gas supply indicator A is displayed in reverse video and blinks (Situation **3** on table 2).

4. CO_2 gas empty alarm is released by pressing Buzzer key. The reverse video is put the light off (Situation **4** on table 2).

5. Exchange the empty CO_2 gas cylinder A into a new one immediately after the Situation **4** (Situation **5** on table 2).

6. When CO_2 gas cylinder B is empty, it changes into CO_2 gas cylinder A.

Table 2 CO_2 gas supply line automatic changeover

(e.g.) When CO_2 gas cylinder A is empty, it changes over CO_2 gas cylinder B.

	Situation	CO_2 gas			CO_2 gas supply line indicator			Message display field
		Supply line	Cylinder A	Cylinder B		A	B	
1	CO_2 gas is supplying from valve A.	A	Remaining	Remaining		Light on	Light off	
2	CO_2 density in the chamber is not increased even if CO_2 gas valve opens.	A	Empty	Remaining		Light on	Light off	
3	CO_2 gas supply line is changed over B automatically.	B	Empty	Remaining		Reverse video and blink	Light on	Err01: CO_2 Gas Empty (and buzzer)
4	Pressed Buzzer key.	B	Empty	Remaining		Light off	Light on	
5	Changed empty gas cylinder A into a new one.	B	Remaining	Remaining		Light off	Light on	

Note:

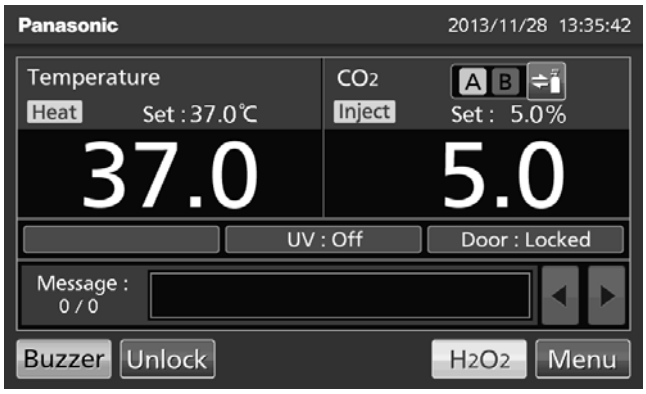
・When the Buzzer key is not pressed in the Situation **4** and the CO_2 gas cylinder B gets empty without the CO_2 gas cylinder A being replaced in the Situation **5**, the operation of switch between CO_2 gas supply line A and B will be repeated. In this case, replace the both CO_2 gas cylinders, A and B, and press the Buzzer key immediately.

・The changeover of CO_2 gas cylinder is judged by an increaes of CO_2 density in the chamber. In case that the gas tube is clogged, the gas is leaking, the gass pressure is dropped down, or the level of valve open for CO_2 gas cylinder is not enough, etc, the changeover of CO_2 gas cylinder may be done even though the CO_2 gas cylinder being used is not empty.

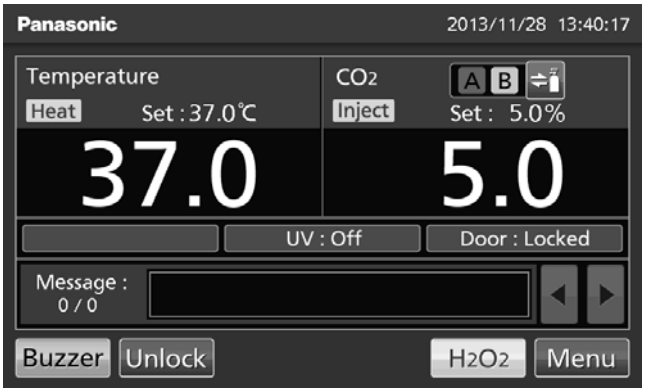
Manual CO_2 gas supply line changeover

It is possible to change CO_2 gas supply line manually anytime.
Example) Change CO_2 gas supply line A to B.

1. Press CO_2 gas supply line select key for a few seconds.



2. CO_2 gas supply line A is changed to B.



Note: The behavoir for the following case is shown in Table 3.
After the CO_2 gas supply line is changed over by CO_2 gas automatic changer function, the empty CO_2 gas is manually retuned to the CO_2 gas supply line before the Buzzer key is pressed.

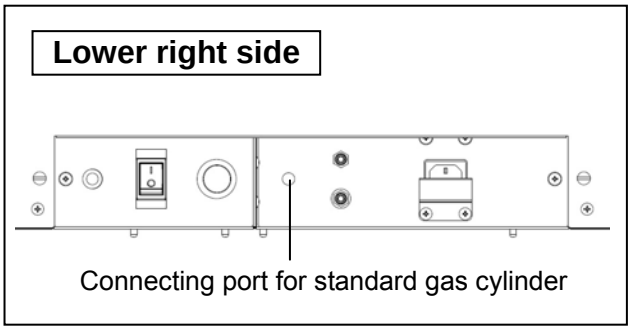
Table 3 After changed into CO_2 gas cylinder B because CO_2 gas cylinder A is empty, if you changed into A manually.

	Situation	CO_2 gas			CO_2 gas supply line indicator			Message display field
		Supply line	Cylinder A	Cylinder B		A	B	
1	Changed into CO_2 gas supply line B automatically.	B	Empty	Remaining		Reverse video and blink	Light on	Err01: CO_2 Gas Empty (and buzzer)
2	Not press Buzzer key, long-pressed CO_2 gas supply line select key.	A	Empty	Remaining		Blink	Light off	Err01: CO_2 Gas Empty (and buzzer)

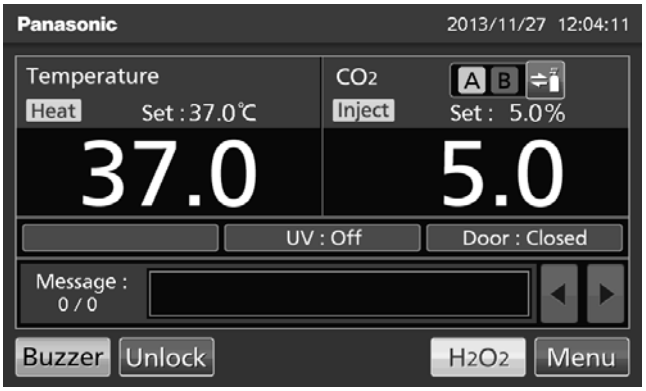
STD GAS AUTO CALIBRATION KIT (OPTION)

When a STD gas auto calibration kit MCO-SG is installed, by connecting standard gas cylinder for calibration, it is possible to calibrate CO_2 density manually.

1. Connect a standard gas cylinder to connecting port for standard gas cylinder on lower right side of the CO_2 incubator. Since a Standard gas cylinder is used as a standard of exact density during CO_2 density calibration, prepare a standard gas cylinder that is same as the set CO_2 density.
Note: There is not the problem to remain connected standard gas cylinder after finished CO_2 gas density calibration.

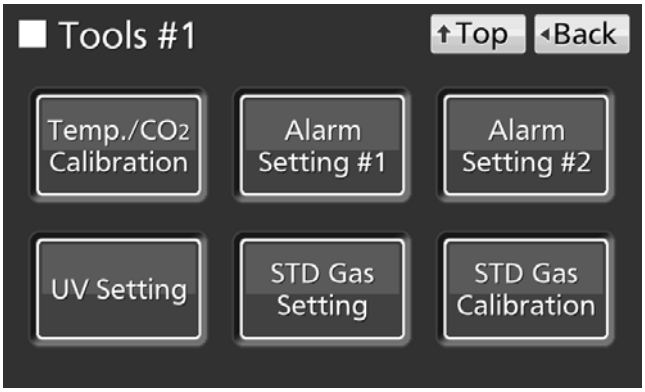


2. Press Menu key to lead the Menu screen.

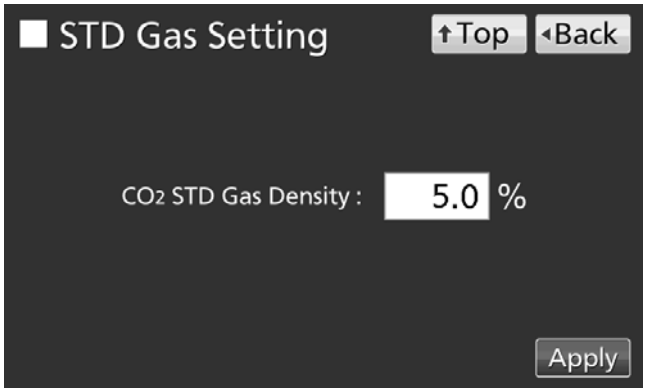


3. Press Tools #1 key to lead the Tools #1 screen.

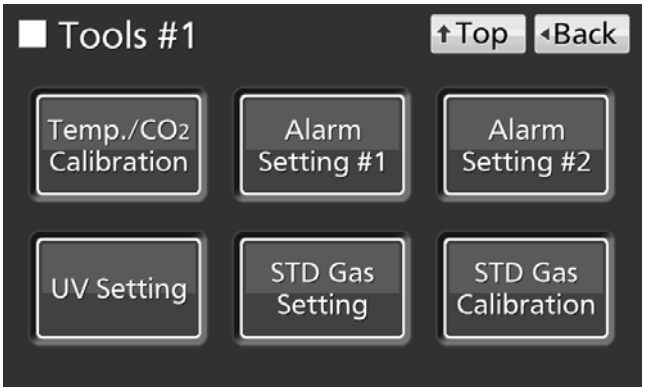
4. Press STD Gas Setting key to lead the STD Gas Setting screen.



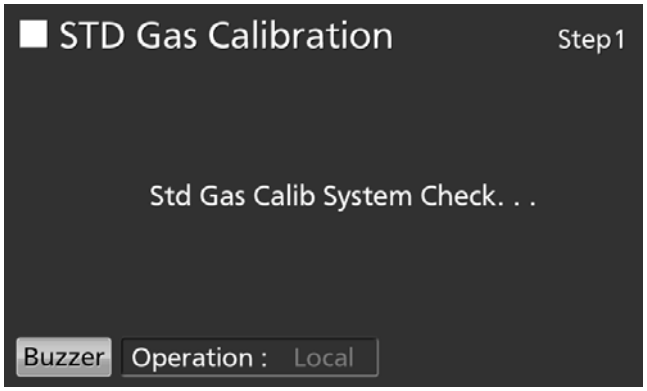
5. On the STD Gas Setting screen, input CO_2 density of the connected standard CO_2 gas cylinder. Press Apply key to save the input value. The display returns to the Tools #1 screen.
Settable range: 4.0 %～21.0 %.
Factory setting: 5.0 %.



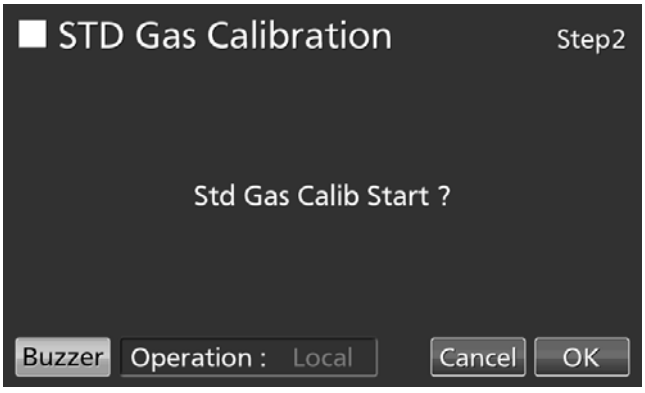
6. Press STD Gas Calibration key to lead the STD Gas Calibration screen.



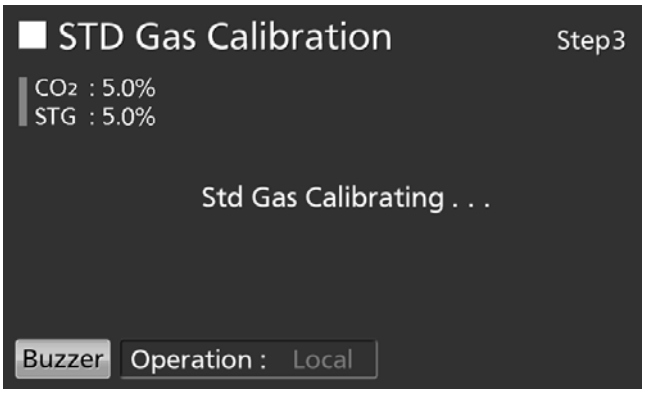
7. On the STD Gas Calibration Step1 screen, system check starts automatically. If the system is normal, display leads the STD Gas Calibration Step2 screen.



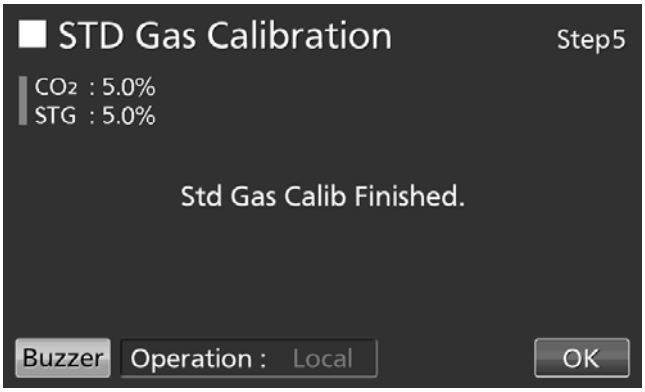
8. On the STD Gas Calibration Step2 screen, press OK key to lead the STD Gas Calibration Step3 screen.



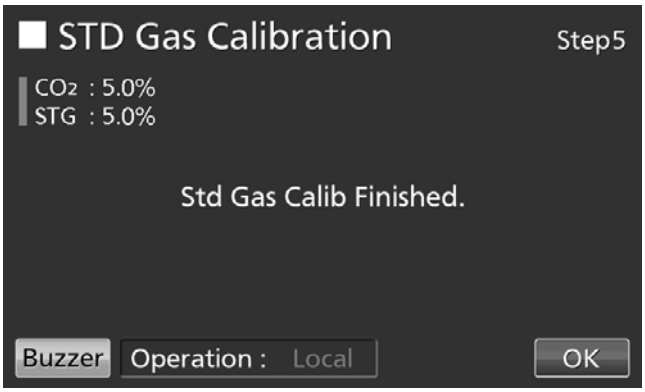
9. On the STD Gas Calibration Step3 screen, CO_2 density calibration starts. Calibration go to Step5 (Procedure **10**) automatically.



10. After completion of CO_2 density calibration, display leads the STD Gas Calibration Step5 screen. CO_2 incubator returns to the normal operation.



11. On the STD Gas Calibration Step5 screen, press OK key to return to the Tools #1 screen. On the Tools #1 screen, press Top key to return to the Top screen.



ROUTINE MAINTENANCE

To use this unit in a clean condition, clean the chamber and all the inner attachments at least once a month.

1. Remove all the inner attachments by the procedures shown on page 22.

2. Clean the chamber and all the inner attachments by the procedures shown on page 21.

3. Install all the inner attachments by the procedures shown on page 24.

●When there is excessive dirt, contact our sales representative or agent.

ALARMS, SAFETY, AND SELF-DIAGNOSIS

The incubator supports the following alarms, safety functions, and self-diagnostic functions. If an error from Err05 to Err18, or Err56 is activated, contact our sales representative or agent.

Table 4 Alarms, safety, and self-diagnosis for culture operations

Alarm or safety function	Conditions	Display	Buzzer	Remote alarm	Safety operation
High limit temperature alarm	The chamber temperature exceeds the high limit alarm temperature set value.	"Over Heat" is displayed alternately in normal characters and reverse video in the Over heat display.	Continuous tone	ON	Heater OFF.
Automatic set temperature alarm	The chamber temperature is out of the automatic set temperature alarm setting range (±1.0 °C to ±5.0 °C).	"Warning: High Temp" or "Warning: Low Temp" is displayed in the message display field.	Intermittent tone after set alarm delay time (0 min to 15 min) has elapsed	ON after set alarm delay time (0 min to 15 min) has elapsed	-----
Automatic set CO_2 density alarm	The chamber CO_2 density is out of the automatic set CO_2 density alarm setting range (±0.5 % to ±5.0 %).	"Warning: High CO2 Density" or "Warning: Low CO2 Density" is displayed in the message display field.	Intermittent tone after set alarm delay time (0 min to 15 min) has elapsed	ON after set alarm delay time (0 min to 15 min) has elapsed	-----
Auto-return	On screens other than the Top screen, there is no key operation for approx. 90 s. (When the sleep function is ON) After sleep function is turned ON, there is no alarm/error and key operation for approx. 90 s.	(Return to the "Top screen".)	-----	-----	-----
Door alarm	The outer door is open.	"Door: Open" is displayed alternately in normal characters and reverse video in the outer door (opening/closing) display.	Intermittent tone after set alarm delay time (1 min to 30 min) has elapsed	-----	The CO_2 valve is closed. The heater turns OFF after 1 min.
Door lock error	(MCO-230AICUVH or when an optional MCO-170EL is installed) Outer door is opened when it is auto-locked by electric lock.	"Err20: Door Lock Failure" is displayed in the message display field.	Intermittent tone	ON	UV lamp OFF
CO_2 gas cylinder empty	The CO_2 density does not increase when the CO_2 valve is opened.	"Err01: CO2 Gas Empty" is displayed in the message display field.	〃	〃	-----
Chamber temperature sensor error	The chamber temperature sensor is disconnected.	"Err05: Temp Sensor Open" is displayed in the message display field.	〃	〃	Heater OFF.
	The chamber temperature sensor is short-circuited.	"Err06: Temp Sensor Short" is displayed in the message display field.	〃	〃	Heater OFF.
Sensor box temperature sensor error	The sensor box temperature sensor is disconnected.	"Err07: CO2 Box Temp Sensor Open" is displayed in the message display field.	〃	〃	CO_2 valve is closed.
	The sensor box temperature sensor is short-circuited.	"Err08: CO2 Box Temp Sensor Short" is displayed in the message display field.	〃	〃	CO_2 valve is closed.
Ambient temperature sensor error	The ambient temperature sensor is disconnected.	"Err09: AT Sensor Open" is displayed in the message display field.	〃	〃	-----
	The ambient temperature sensor is short-circuited.	"Err10: AT Sensor Short" is displayed in the message display field.	〃	〃	-----
CO_2 sensor error	The Vref or Vgas output voltage for the CO_2 sensor is abnormal.	"Err11: CO2 Sensor Vref Abnormal" or "Err12: CO2 Sensor Gas Abnormal" is displayed in the message display field.	〃	〃	CO_2 valve is closed.
Main heater error	Main heater burnout occurs or the main heater SSR is short-circuited.	"Err13: Main Heater Abnormal" is displayed in the message display field.	〃	〃	-----
Bottom heater error	Bottom heater burnout occurs or the bottom heater SSR is short-circuited.	"Err14: Humidity Heater Abnormal" is displayed in the message display field.	〃	〃	-----
Door heater error	Door heater burnout occurs or the door heater SSR is short-circuited.	"Err15: Door Heater Abnormal" is displayed in the message display field.	〃	〃	-----
Sensor box heater error*1	a) High limit temperature alarm is activated. b) The sensor box heater burnout occurs or the sensor box heater SSR is short-circuited.	"Err16: CO2 Box Heater Abnormal" is displayed in the message display field.	〃	〃	-----
Heater SSR burnout*1	a) High limit temperature alarm is activated. b) Main, bottom, door, or sensor box heater SSR burnout occurs.	"Err17: Heater SSR Open" is displayed in the message display field.	〃	〃	-----

*1: After a while after the high limit temperature alarm is activated, Err16 (Sensor box heater error) and Err17 (Heater SSR burnout) are activated.

Alarm or safety function	Conditions	Display	Buzzer	Remote alarm	Safety operation
UV lamp failure	(MCO-230AICUVH/MCO-230AICUV, or when an optional MCO-170UVS is installed) The UV lamp burns out.	"Err18: UV Lamp Abnormal" is displayed in the message display field.	Intermittent tone	ON	-----
New UV lamp replacement	(MCO-230AICUVH/MCO-230AICUV, or when an optional MCO-170UVS is installed) The accumulated ON time reaches approx. 5,000 h.	"Warning: UV Bulb Life" is displayed in the message display field.	-----	-----	-----
Communication error	When communication between LCD touch panel and control substrate is died out or unstable.	"Err56: Communication Failure" is displayed in the message display field.	-----	-----	-----
Warming-up of gas control	After power switch is turned ON, under warming-up before temperature is stable and gas control is enabled.	"Status: Gas sensor initializing" is displayed in the message display field.	-----	-----	-----

●Table 5～7 show the behavior of the alarm (buzzer) and Ring Back function when pressing Buzzer key.

Table 5　In the cases of other than table 6 or table 7.

Remote Alarm setting	Ring Back setting	Buzzer from CO_2 incubator		Remote Alarm	
		When pressing the Buzzer key	When the Ring Back set time passes	When pressing the Buzzer key	When the Ring Back set time passes
ON: Non-interlock with Buzzer key	ON	OFF (Alarm is not canceled)	ON	ON	ON (Under continuation)
	OFF		OFF		
OFF: Interlock with Buzzer key	ON		ON	OFF (Alarm is not canceled)	ON
	OFF		OFF		OFF

Note: Resolve the cause of the alarm in reference to page 83-85 because the alarm itself is not deactivated by pressing Buzzer key.

Table 6　In the cases of high limit temperature alarm or Err38 (The outer door opens during H_2O_2 decontamination; refer to next page).

Remote Alarm setting	Ring Back setting	Buzzer from CO_2 incubator		Remote Alarm	
		When pressing the Buzzer key	When the Ring Back set time passes	When pressing the Buzzer key	When the Ring Back set time passes
ON: Non-interlock with Buzzer key	ON	ON	ON (Under continuation)	ON (Continue)	ON (Under continuation)
	OFF				
OFF: Interlock with Buzzer key	ON				
	OFF				

Note: Close the outer door when Err38 is activated.

Table 7　In the cases of Err01 (CO_2 gas cylinder empty), Err11, 12 (CO_2 sensor error), Err18 (UV lamp failure) or door alarm*[2].

Remote Alarm setting	Ring Back setting	Buzzer from CO_2 incubator		Remote Alarm setting	
		When pressing the Buzzer key	When the Ring Back set time passes	When pressing the Buzzer key	When the Ring Back set time passes
ON: Non-interlock with Buzzer key	ON	OFF (Alarm is canceled)	OFF (Alarm is already canceled)	OFF (Alarm is canceled*[2])	OFF (Alarm is already canceled*[2])
	OFF				
OFF: Interlock with Buzzer key	ON				
	OFF				

*2: In the door alarm, the remote alarm does not work.

Note: When Err01 is activated, connect the new CO_2 gas cylinder and press the Buzzer key to stop the buzzer. In addition, when the optional MCO-21GC is installed and the gas supply is switched to the reserve gas cylinder, press the Buzzer key and replace the gas cylinder.

Table 8 Alarms and Safety functions for H_2O_2 decontamination

Alarm or safety function	Conditions	Display	Buzzer	Remote alarm	Safety operation
System check error at start of H_2O_2 decontamination	The H_2O_2 generator is not connected.	"Err31: H2O2 Unit Not Connected" is displayed in the message display field.	-----	-----	H_2O_2 decontamination is cancelled.
	There is no H_2O_2 solution or the H_2O_2 level sensor has failed (or is disconnected).	"Err32: Low H2O2 Level" is displayed in the message display field.	-----	-----	H_2O_2 decontamination is cancelled.
	The door is not closed.	"Err33: Outer Door Open" is displayed in the message display field.	-----	-----	H_2O_2 decontamination is cancelled.
Failure during warming-up	Power was interrupted.	After power is restored, return to the "Top Display".	-----	-----	-----
	The outer door is open.	"Err38: Door Lock Failure" is displayed in the message display field.	Continuous tone (when the outer door is open.)	ON (when the outer door is open.)	H_2O_2 decontamination is cancelled.
Failure during H_2O_2 decontamination	The volume of H_2O_2 generated is abnormal.	"Err34: H2O2 Volume" is displayed in the message display field.	Intermittent tone with 15min delay	ON with 15 min delay	Moves to UV resolve.
	Power was interrupted during H_2O_2 decontamination.	After power is restored, "Err35: Power Failure" is displayed in the message display field.	Intermittent tone	ON	・During power failure, outer door is locked by electric lock. ・After power is restored, moves to UV resolve.
	The outer door is open.	"Err38: Door Lock Failure" is displayed in the message display field.	Continuous tone (when the outer door is open.)	ON (when the outer door is open.)	・H_2O_2 mist generation is cancelled. ・Resolve time is extended.
Failure during H_2O_2 gas resolve by UV.	The UV lamp failed during H_2O_2 gas resolve by UV.	"Err36: UV Lamp Failure" is displayed in the message display field.	Intermittent tone	ON	Resolve time is extended.
	Power was interrupted during H_2O_2 gas resolve by UV.	After power is restored, "Err37: Power Failure" is displayed in the message display field.	-----	-----	・During power failure, outer door is locked by electric lock. ・After power is restored, UV resolve is repeated.
	The outer door is open.	"Err38: Door Lock Failure" is displayed in the message display field.	Continuous tone (when the outer door is open.)	ON (when the outer door is open.)	Resolve time is extended.

Table 9 Alarm and Safety functions for STD Gas Calibration

Alarm or safety function	Conditions	Display	Buzzer	Remote alarm	Safety operation
System check error at start/operating of automatic CO_2 density calibration	The gas pressure of CO_2 gas line for the standard gas calibration is less than the specified pressure.	"Std GAS Calib Error" and "Err41: Std Gas Empty" are displayed in the center of the LCD touch panel.	Intermittent tone	ON	The STD Gas calibration is cancelled.

Note: MCO-230AICUVH or when an optional electric lock MCO-170EL is installed to the MCO-230AICUV/ 230AIC, an unlock key is provided in order to unlock the outer door during a power interruption or in case the electric lock fails. Always store this key in a safe place. It is recommended that you make a note of the key symbol and number in case the key is lost.

⚠WARNING

Do not use the unlock key to unlock the outer door during H_2O_2 decontamination or during H_2O_2 gas resolve by UV. Doing so may cause harm to health from H_2O_2 gas leakage.

TROUBLESHOOTING

If the incubator does not seem to be working properly, check the following items before calling for service.

Symptom	Items to check and countermeasures
The incubator does not operate at all.	• Is the incubator plugged in? • Is there a power outage, or has a circuit breaker interrupted the power? • The removal power supply cord is connected to the port attached on the lower right side of the cabinet.
An alarm is activated.	【When starting operation】 • Does the chamber temperature match the set value? • Does the CO_2 gas density in the chamber match the set value? (1) Is the secondary pressure for the gas regulator at the specified value of 0.03 MPa(G) (0.3 kgf/cm^2(G), 4.3 psi(G))? (2) Is the gas tube properly connected? 【During operation】 • Is the high limit alarm temperature set at least 1 °C higher than the chamber set temperature? • Has the temperature setting been changed? Has the outer door been left open for a long time? Has a low-temperature object been placed in the chamber? If any of these is the case, the alarm will be automatically cleared if you wait. • Has the gas tube come loose, or is there a gas leak? • Has the CO_2 gas density setting been changed? • Is the gas cylinder empty? Check the primary pressure of the gas cylinder once a week. (When the primary pressure is 3.8 MPa(G) (38 kgf/cm^2(G), 551 psi(G)) or lower, it is a sign that there is little gas remaining. Replace the cylinder soon.) • Is the incubator operating beside the appliance that generates the electromagnetic wave?
The chamber temperature does not match the set value.	• Is the ambient temperature less than 5 °C different from the set value for the chamber temperature? • Is the outer door closed with the inner door left open? • Is the incubator operating beside the appliance that generates the electromagnetic wave?
The chamber humidity does not rise.	• Is there enough water in the humidifying pan? (Be sure to use sterile distilled water.)
The CO_2 gas density does not match the set value.	• Is the secondary pressure for the gas regulator at the specified value of 0.03 MPa(G) (0.3 kgf/cm^2(G), 4.3 psi(G))? • Is the gas tube blocked? • Is the duct securely attached? Attach the duct properly to the 4 points hooks. (Fig. 1 on page 88) • Is the fan attached properly? Confirm if the fan is pushed all the way to the motor shaft. (Fig. 2 on page 88) • Is the incubator operating beside the appliance that generates the electromagnetic wave?
A large quantity of CO_2 gas is being consumed.	• Are the outer and inner doors being frequently opened and closed? • Check whether gas is leaking from connectors due to deterioration of the gas tube, or whether there may be any pinhole leaks. The gas tube is a replaceable part, and it is recommended that it be replaced once a year. • Is the packing seal for the inner door defective? • Is the access hole open?

Symptom	Items to check and countermeasures
Normal cultures are not possible, and the CO_2 gas density is suspect.	• Is the ambient air environment around the incubator normal? Is there a source of polluted gas in the vicinity?
CO_2 gas is not being injected.	• The CO_2 control method for the incubator is the ON-OFF method. CO_2 gas is intermittently injected as the gas density in the chamber approaches the set value. Injections may be stopped for periods of approximately 15 seconds, but that is not an error. • The gas is not injected until the temperature of the CO_2 sensor becomes stable enough approx. 1 hour, after turning ON the power switch or recovering from power failure.
The CO_2 gas density is slow to recover.	• A HEPA filter is used for the incubator CO_2 gas piping. If gas density is slow to recover when the CO_2 gas pressure is normal, it is possible that the HEPA filter may be clogged. Contact our sales representative or agent. • Is there little gas remaining in the CO_2 gas cylinder? • Is the secondary pressure for the gas regulator at the specified value of 0.03 MPa(G) (0.3 kgf/cm^2(G), 4.3 psi(G))? • Is the gas tube blocked? • Is the duct securely attached? Attach the duct properly to the 4 points hooks. (Fig. 1) • Is the fan attached properly? Confirm if the fan is pushed all the way to the motor shaft. (Fig. 2)
UV lamp lights when the outer door is open.	• Does something push the door switch?
The outer door does not open.	MCO-230AICUVH, or when the optional MCO-170EL is installed: • When the power switch is OFF, the electric lock is locked and the outer door does not open. Either turn ON the power switch or use the accessory unlock key to override the electric lock. • During decontamination the outer door is electrically locked and does not open.

TROUBLESHOOTING

Symptom	Items to check and countermeasures
H_2O_2 decontamination cannot be performed.	• If the MCO-230AICUVH is being used, is the optional MCO-HP installed? • If the MCO-230AICUV is being used, are the optional MCO-HP, the optional MCO-170HB and the MCO-170EL installed? • If the MCO-230AIC is being used, are the optional MCO-170UVS, the MCO-HP, the optional MCO-170HB and the MCO-170EL installed? • Is the UV lamp burned out? If the UV lamp is burned out, H_2O_2 decontamination will not be possible. • Is the H_2O_2 generator cable properly connected? • Has the entire bottle of the H_2O_2 reagent been used?
In H_2O_2 decontamination cycle, "Err34: H2O2 Volume" is activated.	• Is the duct securely attached? Attach the duct properly to the 4 points hooks. (Fig. 1) • Is the fan attached properly? Confirm if the fan is pushed all the way to the motor shaft. (Fig. 2) • Is the H_2O_2 generator securely installed? Set the 2 pins of the H_2O_2 generator in the 2 holes at the left bottom of the duct. (Fig. 3) • Is it the end-of-life of the H_2O_2 generator? If the total operating time exceeds 5,000 hours, replace the H_2O_2 generator.

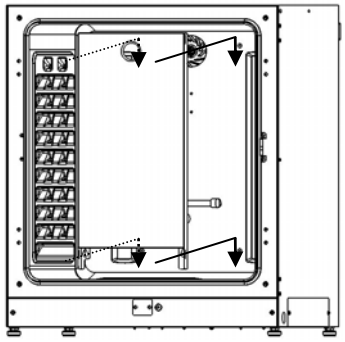
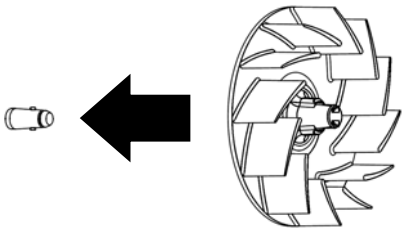


Fig. 1

①Position the center hole of the fan with the projection of the motor shaft. And insert it deeply.



②Lightly turn the fan manually to make sure that it does not touch the rear panel.

③Lightly pull the fan manually to make sure that it is installed.

Fig. 2

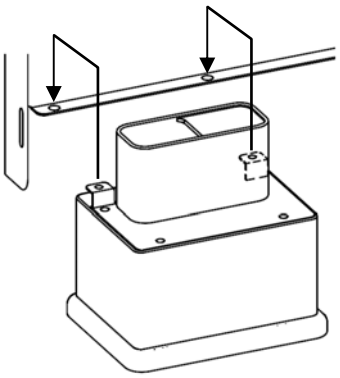


Fig. 3

Note: If the problem still has not been solved after trying the above checks and countermeasures, or for any problems not covered here, contact our sales representative or agent.
Keep an electric product which emits an electromagnetic wave away from this product. A noise from an electromagnetic wave may cause malfunction to this product.

DISPOSAL OF UNIT

When disposing of the CO_2 incubator, contact our sales representative or agent.

⚠WARNING

The CO_2 incubator must be dismantled and disposed of by qualified personnel only. If the CO_2 incubator is left where outsiders enter, it may result unexpected accident (for example, children to become locked inside).

Before disposing the CO_2 incubator with biohazardous danger, decontaminate the CO_2 incubator to the extent possible by the user.

DISPOSAL OF UNIT

Note:
This symbol mark and recycle system are applied only to EU countries and not applied to the countries in the other area of the world.

Waste Electrical and Electronic Equipment (WEEE) Directive

(English)
Your Panasonic product is designed and manufactured with high quality materials and components which can be recycled and reused.

This symbol means that electrical and electronic equipment, at their end-of-life, should be disposed of separately from your household waste.

Please dispose of this equipment at your local community waste collection/recycling centre.

In the European Union there are separate collection systems for used electrical and electronic products.

Please help us to conserve the environment we live in!

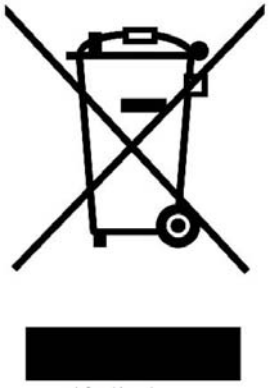
(German)
Ihr Panasonic Produkt wurde entworfen und hergestellt mit qualitativ hochwertigen Materialien und Komponenten, die recycelt und wiederverwendet werden können.

Dieses Symbol bedeutet, daß elektrische und elektronische Geräte am Ende ihrer Nutzungsdauer von Hausmüll getrennt entsorgt werden sollen.

Bitte entsorgen Sie dieses Gerät bei Ihrer örtlichen kommunalen Sammelstelle oder im Recycling Centre.

In der Europäischen Union gibt es unterschiedliche Sammelsysteme für Elektrik- und Elektronikgeräte.

Helfen Sie uns bitte, die Umwelt zu erhalten, in der wir leben!



(French)
Votre produit Panasonic est conçu et fabriqué avec des matèriels et des composants de qualité supérieure qui peuvent être recyclés et réutilisés.

Ce symbole signifie que les équipements électriques et électroniques en fin de vie doivent être éliminés séparément des ordures ménagères.

Nous vous prions donc de confier cet équipement à votre centre local de collecte/recyclage.
Dans l'Union Européenne, il existe des systèmes sélectifs de collecte pour les produits électriques et électroniques usagés.

Aidez-nous à conserver l'environnement dans lequel nous vivons !

Les machines ou appareils électriques et électroniques contiennent fréquemment des matières qui, si elles sont traitées ou éliminées de manière inappropriée, peuvent s'avérer potentiellement dangereuses pour la santé humaine et pour l'environnement.
Cependant, ces matières sont nécessaires au bon fonctionnement de votre appareil ou de votre machine. Pour cette raison, il vous est demandé de ne pas vous débarrasser de votre appareil ou machine usagé avec vos ordures ménagères.

(Spanish)
Los productos Panasonic están diseñados y fabricados con materiales y componentes de alta calidad, que pueden ser reciclados y reutilizados.

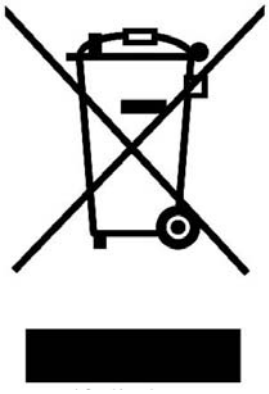
Este símbolo significa que el equipo eléctrico y electrónico, al final de su ciclo de vida, no se debe desechar con el resto de residuos domésticos.

Por favor, deposite su viejo equipo en el punto de recogida de residuos o contacte con su administración local.

En la Unión Europea existen sistemas de recogida específicos para residuos de aparatos eléctricos y electrónicos.

Por favor, ayúdenos a conservar el medio ambiente!

DISPOSAL OF UNIT



(Portuguese)
O seu produto Panasonic foi concebido e produzido com materiais e componentes de alta qualidade que podem ser reciclados e reutilizados.

Este símbolo significa que o equipamento eléctrico e electrónico no final da sua vida útil deverá ser descartado separadamente do seu lixo doméstico.

Por favor, entregue este equipamento no seu ponto local de recolha/reciclagem.

Na União Europeia existem sistemas de recolha separados para produtos eléctricos e electrónicos usados.

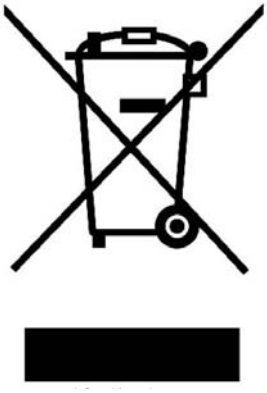
Por favor, ajude-nos a conservar o ambiente em que vivemos!

(Italian)
Il vostro prodotto Panasonic è stato costruito da materiali e componenti di alta qualità, che sono riutilizzabili o riciclabili.

Prodotti elettrici ed elettronici portando questo simbolo alla fine dell'uso devono essere smaltiti separatamente dai rifiuti casalinghi.

Vi preghiamo di smaltire questo apparecchio al deposito comunale.
Nell'Unione Europea esistono sistemi di raccolta differenziata per prodotti elettrici ed elettronici.

Aiutateci a conservare l'ambiente in cui viviamo!



(Dutch)
Panasonic producten zijn ontwikkeld en gefabriceerd uit eerste kwaliteit materialen, de onderdelen kunnen worden gerecycled en weer worden gebruikt.

Het symbool betekent dat de elektrische en elektronische onderdelen wanneer deze vernietigd gaan worden , dit separaat gebeurt van het normale huisafval.

Zorg ervoor dat het verwijderen van de apparatuur bij de lokaal erkende instanties gaat gebeuren.
In de Europese Unie wordt de gebruikte elektrische en elektronische apparatuur bij de daarvoor wettelijke instanties aangeboden.

Alstublieft help allen mee om het milieu te beschermen.

(Swedish)
Din Panasonic produkt är designad och tillverkad av material och komponenter med hög kvalitet som kan återvinnas och återanvändas.

Denna symbol betyder att elektriska och elektroniska produkter, efter slutanvändande, skall sorteras och lämnas separat från Ditt hushållsavfall.

Vänligen, lämna denna produkt hos Din lokala mottagningstation för avfall/återvinningsstation.

Inom den Europeiska Unionen finns det separata återvinningssystem för begagnade elektriska och elektroniska produkter.

Vänligen, hjälp oss att bevara miljön vi lever i!

SPECIFICATIONS

Product name	CO_2 incubator MCO-230AIC	CO_2 incubator MCO-230AICUV	CO_2 incubator MCO-230AICUVH
External dimensions	W770 mm x D730 mm x H905 mm (W30.3 inch x D28.7 inch x H35.6 inch)		
Internal dimensions	W643 mm x D523 mm x H700 mm (W25.3 inch x D20.6 inch x H27.6 inch)		
Interior volume	230 L (8.12 cu.ft.)		
Exterior	Painted steel (Rear cover has no paint)		
Interior	Stainless steel containing copper		
Outer door	Painted steel		
Inner door	Tempered glass		
Trays	4 trays made of stainless steel containing copper W620 mm x D450 mm x H12 mm (W24.4 inch x D17.7 inch x H0.47 inch) Maximum load: 7 kg/tray		
Access port	Inner diameter: 30 mm (1.18 inch), On the back side		
Insulation	Extruded polystyrene foam		
Heating system	DHA system (heater jacket + air jacket system)		
Heater	345 W		
Humidifying system	Natural evaporation with humidifying pan		
Temperature controller	PID control system		
Temperature display	Digital display		
CO_2 controller	PID control system		
CO_2 density display	Digital display		
Air circulation	Fan assisted		
Air filter	0.3 μm, Efficiency: 99.97 % or higher		
UV lamp	-----	4 W x 1 (ozone-free emission)	
Alarms	Automatic set temperature alarm, Automatic set CO_2 density alarm, High limit temperature alarm, CO_2 gas, various sensor/heater alarms		
Remote alarm contacts	Allowable contact capacity: DC 30 V, 2 A		
CO_2 inlet connection	4 mm to 6 mm (0.157 inch to 0.236 inch) diameter tube can be connected		
CO_2 inlet pressure	0.03 MPa(G) (0.3 kgf/cm^2(G), 4.3 psi(G))		
Weight	90 kg		
Accessories	-----		2 unlock key
	1 removal power supply cord, Power supply cord cover plate, 4 trays 1 gas tube, 1 humidifying pan, 2 tube bands		

Product name	CO_2 incubator MCO-230AIC	CO_2 incubator MCO-230AICUV	CO_2 incubator MCO-230AICUVH
Optional accessories (Refer to table 10)	UV system set (MCO-170UVS)	standard equipment	
	H2O2 decon board (MCO-170HB), Electric lock (MCO-170EL)		standard equipment
	H_2O_2 generator (MCO-HP)		
Optional accessories (Refer to table 11)	Double stacking bracket (MCO-170PS) Stacking plate (MCO-230SB)		
Optional accessories	H_2O_2 reagent (MCO-H2O2) Gas regulator (MCO-100L) Gas auto changer (MCO-21GC) STD gas auto calibration kit (MCO-SG) Tray (MCO-230ST: same as that of standard accessory) Half tray (MCO-35ST) Roller base (MCO-230RB) Interface board (MCO-420MA) (USA only) Small door (MCO-230ID)		
Optional Software product	Data acquisition system (MTR-5000) Interface board (MTR-L03); For LAN Interface board (MTR-480); For RS-232C/RS-485		
Optional product for using in the chamber	Shaker for CO_2 incubator (MIR-S100C)		

Note: Refer to the updated catalog when ordering an optional component.
Designs and specifications are subject to change without notice.

Table 10 Optional accessories for each function

	MCO-230AIC	MCO-230AICUV	MCO-230AICUVH
To disinfect by UV	UV system set (MCO-170UVS)	standard equipment	
To decontaminate by H_2O_2.	UV system set (MCO-170UVS) H_2O_2 generator (MCO-HP) H2O2 decon board (MCO-170HB) Electric lock (MCO-170EL)	H_2O_2 generator (MCO-HP) H2O2 decon board (MCO-170HB) Electric lock (MCO-170EL)	H_2O_2 generator (MCO-HP)
To lock the outer door	Electric lock (MCO-170EL)		Standard equipment

SPECIFICATIONS

Table 11 Required bracket/plate for each incubator combination of double stacking

Upper product	MCO-230AIC MCO-230AICUV MCO-230AICUVH MCO-230AICUVL MCO-230AICUVHL	MCO-19AIC MCO-19AICUV MCO-19AICUVH KM-CC17R1 KM-CC17RU1 KM-CC17RH1 MCO-19AICL MCO-19AICUVL MCO-19AICUVHL	MCO-19M MCO-19MUV MCO-19MUVH KM-CM17R1 KM-CM17RU1 KM-CM17RH1 MCO-19ML MCO-19MUVL MCO-19MUVHL	KM-CC17R2 KM-CC17RU2 KM-CC17RH2 MCO-170AIC MCO-170AICUV MCO-170AICUVH MCO-170AICL MCO-170AICUVL MCO-170AICUVHL	MCO-18AC KM-CC17T0 MCO-18ACL
Lower product	MCO-230AIC / 230AICUV / 230AICUVH				
Bracket Plate	Double stacking bracket MCO-170PS	Stacking plate MCO-230SB			

・It is possible to Stacking plate MCO-230SB in the case of the following combination.
Upper product: MCO-230AIC/230AICUV/230AICUVH, MCO-230AICUVL/230AICUVHL
Lower product: MCO-20AIC, MCO-20AICL, KM-CC22RU0

PERFORMANCE

Product name	CO_2 Incubator MCO-230AICUVH MCO-230AICUV MCO-230AIC	
Model number	MCO-230AICUVH-PA MCO-230AICUV-PA	MCO-230AICUVH-PK MCO-230AICUV-PK MCO-230AIC-PK
Temperature control range	Ambient temperature+5 °C to 50 °C* (ambient temperature: 5 °C to 35 °C)	
Temperature distribution	±0.25 °C (ambient temperature: 23 °C, setting: 37 °C, CO_2: 5 %, no load)	
Temperature variation	±0.1 °C (ambient temperature: 23 °C, setting: 37 °C, CO_2: 5 %, no load)	
CO_2 control range	0 % to 20 %	
CO_2 variation	±0.15 % (ambient temperature: 23 °C, setting: 37 °C, CO_2: 5 %, no load)	
Chamber humidity	95 %R.H.±5 %R.H.	
Applicable environment condition	Temperature: 5 °C to 35 °C, Humidity: 80 %R.H. max. (The designed performance may not be obtained If the ambient temperature is equal or less than 15 °C)	
Noise level	25 dB (A scale)	
Power consumption	Max. 430 W	
Heat emission	Max. 1,250 kJ/h	
Rated voltage, frequency	AC 110-120 V, 60 Hz	AC 220 V, 60 Hz
Amperage	Max. 3.8 A	Max. 2.1 A

*When set temperature is 37 °C, ambient temperature must be 32 °C or less. Regardless of ambient temperature, the maximum of temperature control range is always 50 °C.

Note: The unit with CE mark complies with EC directives.
Based on our measuring method.

⚠ CAUTION

Please fill in this form before servicing.
Hand over this form to the service engineer to keep for his and your safety.

Safety check sheet

1. Unit contents :

Risk of infection:	☐Yes	☐No
Risk of toxicity:	☐Yes	☐No
Risk from radioactive sources:	☐Yes	☐No

(List all potentially hazardous materials that have been stored in this unit.)
Notes :

2. Contamination of the unit

Unit interior		
No contamination	☐Yes	☐No
Decontaminated	☐Yes	☐No
Contaminated	☐Yes	☐No
Others:		

3. Instructions for safe repair/maintenance/disposal of the unit

a) The unit is safe to work on	☐Yes	☐No
b) There is some danger (see below)	☐Yes	☐No

Procedure to be adhered to in order to reduce safety risk indicated in b) below.

Date :
Signature :
Address, Division :
Telephone :

Product name :	Model No.	Serial number :	Date of Installation :
CO_2 incubator	MCO-		

Please decontaminate the unit yourself before calling the service engineer.

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